



FRIDAY, DECEMBER 20, 1895.

CONTENTS

CONTRIBUTIONS:	PAGE.	GENERAL NEWS:	PAGE.
The Painting of Iron Work.....	833	Meetings and Announcements.....	845
The Speed of Trains and the Revolution of the Earth.....	833	Personal.....	845
ILLUSTRATIONS:		Elections and Appointments.....	846
Pennsylvania Compound Mogul Locomotive.....	835	Railroad Construction.....	846
The Strength of Flat Boiler Plates.....	836	Electric Railroad Construction.....	847
Gold's Improved Sealed Jet for Hot Water Heating.....	843	General Railroad News.....	847
EDITORIALS:		Electric Railroad News.....	848
The Interstate Commerce Commission on the Oil Rate Cases.....	840	Traffic.....	848
November Accidents.....	841	MISCELLANEOUS:	
EDITORIAL NOTES.....	840, 841	Technical.....	843
New Publications.....	842	The Scrap Heap.....	844
Trade Catalogues.....	842	The Annual Cost of a Freight Car to its Owner.....	833
GENERAL NEWS:		Notes on English Railroads.....	834
Car Building.....	844	Railroad Economics.....	835
Bridge Building.....	844	Train Accidents in the U. S. in November.....	838
		Steam Heating of Passenger Trains.....	839
		Safe Ending of Boiler Flues.....	839
		Switch Indicators.....	842
		Joint Traffic Association.....	842

Contributions.

The Painting of Iron Work.

NEW YORK, Dec. 13, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In my articles on the "Painting of Iron Work," published in the *Railroad Gazette* of Nov. 29 and Dec. 13 I omitted to say that nowhere in the mass of literature which I have read have I seen any simple and reliable rules for the inspection of pigments and oil to the end that adulteration and the use of improperly prepared materials may be detected and prevented.

Such rules, I believe, would be the most valuable contribution now possible to the available information on this subject.

"CIVIL ENGINEER."

The Speed of Trains and the Revolution of the Earth.

FORT WORTH, Tex.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In 1891 the New York Central & Hudson River Railroad ran a train 436½ miles in 425 minutes and 42 seconds, or an average of 61½ miles per hour. The weight of this train was 460,000 pounds. The same company on September 11, this year, made the remarkable run of the same 436½ miles in 407½ minutes; this was an average of 64.26 miles per hour.

The New York Central, in starting both times from New York City, unnecessarily retarded its own speed. From Albany to Buffalo, due west, the train encountered not only the prevailing west wind, but the force of the earth's revolution eastward.

"Owing to the diurnal rotation of the earth, bodies at the equator press toward the earth with 288ths of the pressure they would were the earth deprived of its rotation. If, therefore, the rotation of the earth could be accelerated until it took only 1/288th of the present sidereal day to make a complete turn or revolution, the centrifugal tendency would be increased (17)² fold; that is, it would be 289 times as great as now, and bodies at the equator would have no pressure downward, or, as we say, would weigh nothing. This rate of revolution would not be sufficient to deprive bodies anywhere else of their entire weight."

Now let us apply this to railroad trains. A train running east, at the equator, would be lightened as compared with the weight on a still earth by $\frac{(V+v)^2}{Rg}$ where V = velocity of the earth's surface nearly 1,500 per second, v = velocity of train, R = equatorial radius of the earth, and g = 32.16, gravity (nearly). If running due west, the result would be $\frac{(V-v)^2}{Rg}$. And the difference of weight between the same train, running east and west with the same velocity, would be (by reduction) $\frac{4Vv}{Rg}$, that is, it would be this fraction of its total absolute pressure. Example: Taking a train, running, say, 70 ft. per second, or nearly 48 miles per hour, this fraction would not be far from $\frac{1}{1600}$ part; if running 60 miles per hour, it would be $\frac{1}{1250}$ part, and if running 100 miles per hour, or 147 ft. per second, it would be the $\frac{1}{750}$ part, nearly; and it would be greater and greater as the speed is increased, and still greater as both speed and weight of the train are increased. The train of the New York Central was 337 ft. long and weighed 565,000 lbs.

This calculation, it will be observed, as said, will be true for the equator. The New York Central train ran from Albany to Buffalo upon about the 42d parallel of latitude, and the formula, in this case, would be $\frac{4Vv}{Rg} \cos \lambda$. Therefore, this calculation should be corrected for this latitude, and would be about $\frac{1}{10}$ as great.

Still, it would seem that the next time [the New York

Central races with itself, it should be from Buffalo to New York City.

ALEX. HOGG.

Mr. Hogg's theory is doubtless correct, but there is one point further to discuss. The difference in centrifugal force between bodies moving west and east, $\frac{4Vv}{Rg}$, is a constant. For as we move from

the equator V and R decrease in the same proportion, as the cosine of the latitude. The effect on the decrease of weight, however, is not constant, for it is the component of the centrifugal force normal to the surface, and the decrease would be $\frac{4Vv}{Rg} \cos \lambda$, as

Mr. Hogg says. But we must also take into account the component of the centrifugal force parallel to the surface shown by NF in the

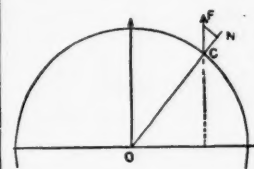


figure. This would be $\frac{4Vv}{Rg} \sin \lambda$, and would cause train to press against the southern rail. This would retard the speed of the

train by an amount $\frac{4Vv}{Rg} \sin \lambda$, where c = coefficient of friction between the wheels and the rails.

1/1000 of 565,000 lbs., the weight of the train, equals 565 lbs. This multiplied by $\cos 42$ deg. equals 261, and multiplied by the \sin equals 236. Assuming c as one-quarter, the retarding effect of the latter is 59 lbs., and the amount of effectual decrease of weight is 261 minus 59, or 202 lbs. Similarly for a speed of 60 miles an hour the effectual decrease is 252 lbs., and for 100 miles an hour it is 423 lbs. However, the component,

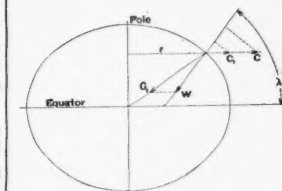
$\frac{4Vv}{Rg} \sin \lambda$, would in practice be overcome by local conditions.

It is to be observed that the fractional amount of decrease is not increased as the weight of the train increases, as Mr. Hogg says; though what he evidently means is that as the weight increases the number of pounds of decrease in weight increases, not the fractional amount, which, for a given rate, at a given place, is constant.

M.

The theory enunciated by Mr. Hogg is doubtless correct, although his mathematical statement of its application is confused. He calculates the centrifugal force at the equator, and states that its influence upon the action of gravity in other latitudes is that force multiplied by $\cos \lambda$, when λ = latitude. That statement is incorrect for several reasons. The R of his mathematical statements, he explains, is the equatorial radius. That would be the proper assumption for small latitudes, while the polar radius should be used for high latitudes, and for such intermediate latitudes as ours the mean radius should be used.

The chief interest in the application of the theory (if any) must be in its practical effect. Let G_1 represent the attraction of the earth upon the train. This force will be almost toward the earth's center and varies somewhat with the latitude, being greatest at the poles. Let C_1 represent the centrifugal force of the train, at rest, due to the earth's rotation. The combination of these two forces results in the apparent weight W of the train. W is, in direction, normal to the fluid surface of the earth, the mobile character of the sea causing the particles to accommodate themselves to the resultant force and producing the spheroidal surface of the earth. It is plain that the effect of centrifugal force, due to rotation of the earth, is very small, as the eccentricity of the earth is so slight.



If r is the radius of the small circle perpendicular to the polar axis, and V is the velocity of rotation of the surface at that latitude, the centrifugal force of the train, when at rest, is $C_1 = \frac{V^2 W}{r g}$. If the train have a velocity v , relative to the surface of the earth, then its actual velocity of rotation is $V \pm v$, the upper sign to be used when the train moves east and the lower sign when the train moves west. The centrifugal force is then $C = \frac{(V \pm v)^2 W}{r g}$. The increase or decrease of centrifugal force is $C - C_1 = \frac{\pm 2Vv + v^2 W}{r g}$. The decrease or increase of weight is $(C - C_1) \cos \lambda = \frac{\pm 2Vv + v^2 W}{r g} \cos \lambda$. The pressure on southern or northern rail is $(C - C_1) \sin \lambda = \frac{\pm 2Vv + v^2 W}{r g} \sin \lambda$. The radius r is a function of the equatorial radius, the latitude and the eccentricity of the ellipse. A sufficiently close approximation for the latitude 43 degs. (not 42 degs.), where the tracks tie, is $r = R \cos \lambda$, where R is the mean radius—about 20,890,000 ft. Approximately, also, the value of $V = \frac{2 \pi R \cos \lambda}{24 \times 60 \times 60} = 1,111$ ft. per second. If the

train travels at a speed of 100 miles per hour, $v = 147$ ft. per second.

Hence $(C - C_1) \cos \lambda = \frac{\pm 2Vv + v^2 W}{r g}$

$= .0174 \frac{W}{g} = .00054 W$ pounds decreased weight going east.

$= .0146 \frac{W}{g} = .000454 W$ pounds increased weight going west.

Also $(C - C_1) \sin \lambda = \frac{\pm 2Vv + v^2 W}{R} \tan \frac{\lambda W}{g}$

$= .00054 W \tan 43 \text{ deg.}$ pounds pressure on southern rail going east.

$= .000454 W \tan 43 \text{ deg.}$ pounds pressure on northern rail going west.

The weight of the train being taken as $W = 565,000$ lbs. The decreased weight going east at 100 miles per hour = 305 lbs. Increased weight going west at 100 miles per hour = 257 lbs. Pressure on southern rails going east at 100 miles per hour = 285 lbs. Pressure on northern rails going west at 100 miles per hour = 239 lbs. At other speeds, these results will vary, approximately (and practically), in proportion to the speed; for example, at 60 miles per hour multiply the above figures by 0.6.

It is well known that when the moon is above us it draws movable objects away from the earth, and when it is on the opposite side of the earth it draws the earth away from movable objects here, thereby causing the tides. It might be well to suggest to the New York Central officers that, as the tides travel from east to west, they may perhaps offset the disadvantages under Mr. Hogg's theory by starting when the position of the moon is propitious, and, as they would "keep in the tide," while going west, they may still be able to make fast time going west, even if the engineers, or indeed the engines themselves, learn of disadvantages of centrifugal force when they are trying to make Buffalo.

R. A. P.

The Annual Cost of a Freight Car to Its Owner.*

Although the late ballot of the American Railway Association did not receive the 75 per cent. of car ownership necessary to adopt the per diem plan in place of the mileage system, yet the fact that it commanded a majority shows very clearly that it is only a question of time; of a few years, or months even, before the present system will give way to the per diem plan of settling for car service. Ever since this reform was first broached by the late William P. Shinn (as far as I am aware), it has possessed the vitality of a true and necessary thing. It seems to have escaped the quagmires of the mongrel system of a mixed per diem and mileage which at one time threatened it, and is likely to be established largely on the lines laid down by Mr. Shinn, of a straight per diem, saving only the rate, in which he appears to have been entirely wrong. The rate to which opinion has constantly gravitated (25 cents) was first advanced by Mr. O. Chanute, Chief Engineer of the Erie Railway, in a communication to the American Society of Civil Engineers, in October, 1883, Mr. Shinn claimed it should be very much higher.

The rate eventually adopted must closely approximate the cost of the car to its owner. It is the aim of the present paper to enumerate the various elements which enter into this cost, to show what portions of them should be taken into account in fixing the rental, and finally to fix within narrow limits the rate that should be attached to each item.

What do we mean by the cost of a car from which we are to deduce the annual or daily rental? I mean by this all the additional expenses which a railroad company or individual will incur by reason of owning and running the car, over and above what it would have to pay out if the car was furnished and maintained without charge by someone else. The items this expense consists of, as railroad accounts are kept, may be enumerated under five heads:

1. Repairs. (Wear and tear.)
2. Renewals. (Depreciation.)
3. Repairs of car shops and machinery, including the rental of same when actually paid, or the interest on the capital invested in them when owned.
4. Salaries and office expenses of employees engaged in keeping track of the cars and settling for their use.
5. Taxes.

These five items, I believe, will be found to embrace the total outlay of the owner. If the car is rented he must, of course, receive

6. Interest on the first cost or capital invested in the car.

And the amount of the rental (provided it is sufficient to cover the above expenses) will determine the rate of interest he receives.

I shall now try to fix the amounts which we should affix to each of these items. The first two items, repairs and renewals, are almost always kept together, no attempt being made to separate them, and they form the bulk of the account "Cars—Repairs of Freight," of the Interstate Commerce Commission classification. Although we may fix the annual cost per car of these repairs within narrow limits, it should be borne in mind that minute accuracy is neither attainable nor desirable. The generally downward tendency of the cost of materials and the use of improved machinery tend to lower the cost, while the introduction of air-brakes and automatic couplers tends to increase it. Besides, it by no means follows that a price which is exact for Pennsylvania is equally true for Georgia. I shall, therefore, content myself with giving a general, round figure like the percentage on the first cost of the car, which will be equally applicable for box and flat cars; figures which have been arrived at from careful consideration through a number of years.

If we have the opportunity of comparing the repairs of an individual car equipment, such as a fast freight line, for instance, with the repairs of the cars of the railroad over which it runs, after making the proper correction in the latter for the repairs of its own cars on foreign roads, we shall probably be surprised at first at the apparent discrepancy between the two. Thus, a box car equipment of an individual owner will cost for a series of years between \$45 and \$50 per car per year, while the cars of the railroad will run from \$60 to \$70, according to the proportion of lower priced cars than box cars which the equipment may contain. The apparent differ-

* By Edmund Yardley, in *Equipment Guide*. Condensed.

ence arises from the fact that a number of items (running repairs) are always paid by the road running the car and are never charged to the foreign car owner. But as they appear in the railroad account they will be included in cost of repairs of the railroad cars unless we take pains to sift them out. We must always be careful to know in any account of car repairs whether the running repairs are or are not included. These repairs can form no portion of the per diem charge, since they are always paid by the road using the car, as user, and never charged to the owner of a foreign car. Briefly, these running repairs consist of repairs to cars damaged in wrecks or derailment, the wages, tools and supplies of car inspectors, and such other items as may be agreed upon from time to time between roads and embodied in the M. C. B. rules. See M. C. B. rules 7, 8 and 9 and the Interstate classification accounts (14).

The amount of the running repairs is supposed to depend upon the mileage made by the car as the most convenient measure, and is said on competent authority to equal one-fourth cent. per car per mile. While this may be true for a mixed equipment of box and gondola or coal cars, in the opinion of the writer one-fifth cent will pay the running repairs of box cars, but the matter is of no consequence here since they are especially excluded from consideration as forming no part of the per diem cost to the owner of the car.

I shall assert then as capable of abundant proof that the sum of the first two items which enter into this account, the wear and tear (so called by me to distinguish it from repairs, which contain running repairs and renewals), and the depreciation equals nine per cent of the cost of a car yearly. That is to say, if a car cost \$500, this will amount to \$45.

Compare on this subject a very interesting paper printed by Mr. E. C. Spalding, October, 1886,* where the average repairs of some 64 box cars are found to be \$44.70 per year. In this case I suspect the running repairs are included and the renewals left out. The depreciation being nearly equal to the running repairs causes the approximation of this sum to the one I have given.

It is often desirable to know the depreciation of the car separate from the repairs. By depreciation I mean the certain sum of money which, if laid aside yearly, with simple interest added, will be sufficient to build a car of like value with the original when that is worn out. The rate per annum of the depreciation depends upon, first, the average life of the cars; second, the value of the scrap from the old car; third, the rate of interest which can be got for the fund that is laid away.

Taking the average life of a car at 13 years, the rate of interest at 5 per cent, and the value of the scrap at 16 per cent of the cost of the car, equal to \$80 for a \$500 car, and we shall find that the yearly depreciation is equal to five per cent. This practically agrees with the M. C. B. rule of six per cent per year up to 10 years.

We then have fixed the first two and most difficult items of our account as follows:

For a car costing \$500:

First, wear and tear per year, 4 per cent.....	\$20.00
Second, depreciation per year, 5 per cent.....	25.00
	\$45.00†

While the depreciation is constant the wear and tear varies, being next to nothing for the first three or four years, then increasing up to the time when the car is generally repaired, when it falls off again. For interesting matter on this subject see the paper of Mr. Spalding, before referred to.

The distinction between running repairs and wear and tear must here be borne in mind. Many items of running repairs are constantly being as much for a new car as an old one.

The third item, repairs of car shops and machinery, is almost always omitted from a consideration of the annual cost of the car, but it clearly should be included. I have practically no data on this point, further than that it has been customary in times past to add 10 per cent. to bills for work done for outside parties as compensation for use of tools, etc. This is probably somewhat more than the actual cost, and as it would amount to \$4.50 per year on \$45 I would make it \$4 or 8 mills on each dollar of the original cost of the car, which cannot be far out of the way.

The next item is too small to put any figures to, five or ten cents per year at most would cover it, and the only object in putting it down was to make the enumeration complete.

The last item, taxes, is also generally omitted from the account, although it is popularly thought that taxes are only one degree less certain than another event which it is to be presumed will happen not only to cars but to the individuals who write about them. The amount of the tax on equipment appears to be about eight mills on the dollar.

We are now prepared to gather our results together, and the amount which the percentages give for both box cars and gondolas are given below:

	Box cars costing \$500.	Gondolas
1. Wear and tear per year, 4 per cent.....	\$20.00	\$45.00
2. Depreciation, 5 per cent.....	25.00	22.50
	\$45.00	\$40.50
3. Repairs of shops, etc., 8 mills.....	4.00	3.60
5. Taxes, 8 mills.....	4.00	3.60
	\$53.00	\$47.70
6. Interest on cost, 6 per cent.....	30.00	27.00
	\$83.00	\$74.70

If the car is 20 days in shops each year, on an average, and I am led to think that is about right, there is 345 days' service in it, which, at 25 cents per day, gives \$86.25.

Notes on English Railroads.

BY J. W. THOMAS, JR.,

Assistant General Manager of the Nashville, Chattanooga & St. Louis Railway

Permanent Way.—The track is up to a remarkable degree of perfection. Stone, gravel and furnace slag are used for ballast. Ties are generally 8 ft. 11 in. long, 10 in. wide and 5 in. thick; are creosoted, and last about 17 years where chairs or tie-plates are used. After doing service in the track they are sawed into 2½-in. plank and used for fencing, facing for platforms and surface drains.

Rails weigh from 60 to 90 lbs. per yard, 30 and 32 ft. being about the usual lengths. The London & North Western is laying some 90-lb. rails 60 ft. long. Rails are laid with even joints, and as a rule are supported in cast

iron chairs and secured in the chairs by wooden wedges driven between rail and side of chair. Chairs are fastened to the ties by bolts or lag-screws. In some of the tunnels felt is put between the chairs and ties to reduce the noise. Where chairs are used, rails have a narrow base or are double-headed. I noticed that chairs wear a depression in the lower head of the double-head rails, and when the rails are turned cars often ride roughly and make a lot of racket. The depressions are a trifle longer than the length of the rail bearing and are as much as ¼ in. deep. The American pattern of rail is used to some extent, and is either placed directly on the ties or on tie-plates.

Angle-bars as well as plain splices are used. They are not over 18 in. or 20 in. long, with four ¾-in. bolts to the joint. Bolt holes in rails are oblong. No spring-rail frogs were seen. The keyed frog seems to be in favor. Split switches have but two tie-bars.

Right-of-way of all important lines is fenced throughout, hedges being used quite extensively. There are many miles of iron fencing. The absence of grade crossings is very striking.

Few metal bridges are to be seen, viaducts of stone or brick being the rule. All bridges that I saw were so constructed as to admit of ballast and road ties being used upon them; remember seeing but one wooden trestle on any of the main lines; this was on the approach to the docks at Dover.

In some localities there are, in addition to the mile posts, quarter, half and three-quarter posts. Some roads mark changes of grade with a post having arms extending parallel with the track; on these is stenciled the number of feet in which track ascends or descends one foot, as "1 in 200," "1 in 1,270." If grade changes from ascending to descending the left arm is inclined upward, the right downward. If grade changes from ascending to level the left arm extends upward and the right arm is horizontal, and so on.

Carriages.—The standard passenger car is about 30 ft. long, and, with the exception of a few excursion and special cars, is divided into compartments, the seats running crosswise. There are three pairs of wheels, one pair at either end and one pair in the center.

Corridor cars vary in length from 40 to 65 ft. Where the aisle is in the center of the car, the seats on one side accommodate two persons and on the other side one person. This arrangement is necessary from the fact that the cars are only 8 ft. 6 in. wide. The shorter cars of this class have three pairs of wheels. The longer ones are carried on two trucks.

What few sleeping cars I saw were 42 ft. long, divided into four compartments and accommodated only eight persons. Two brass bedsteads, each of which are a little narrower than a single bed, in each compartment. No upper berths; price \$1.25 for a berth, and by paying for both berths a passenger can have the entire compartment. Although windows are provided with curtains, a large curtain, quite thick, is hung over the windows. Aisle on one side of car; lavatories at each end.

Passenger trains are equipped with continuous brakes of the Westinghouse or automatic vacuum pattern. Some of the carriages, perhaps 5 or 10 per cent., on roads doing a large joint passenger business, are equipped with both and others have pipe connections for both, but brakes of only one kind. Iron brakebeams are used and every beam is tested before being put in service. Steel and iron are used quite extensively for side and intermediate sills. The body of the carriage is bolted to the sills pretty much as we bolt our tenders to the tender frames, and in some instances about as insecurely. All slack is taken up by the screw couplings.

Mansell wheels are used almost exclusively under passenger cars. These wheels have cast hubs, steel tires and wood filling.

Many of the cars are illuminated with compressed oil gas. Oil lamps are used in large numbers, however. Where oil is used the lamp is put in position through a trap door in the roof and must be lighted from the outside.

Some few dining and sleeping cars are heated with hot water, oil gas being used to heat the water. Ranges in dining cars are heated with gas. As a rule foot warmers are used. I saw a pile of 20,000 of them at the carriage works of the L. & N. W. They are made of heavy tin, 2 ft. long about 1½ in. wide and 4 in. thick; are charged with acetate of soda, and put in a tank of boiling water previous to being put into the carriage. There is a cast-iron ball in the can and after the water cools and the soda begins to re-form into crystals the heater is shaken and the ball breaks up the crystals, thus reheating the water to some extent and the warmer is good for about two hours longer, after which it must be reheated in the tank as before.

Passenger trains have either ordinary bell cord, running outside the carriage and underneath the eaves of the roof, or an electric signaling apparatus. Cars are poorly ventilated with very few raised roofs. A few carriages have lavatories in them. The number of cars so equipped is on the increase. There were no urinals. The hoppers have double lids and are self-flushing. Water coolers seem to be the exception rather than the rule. Drinking water is kept in small water bottles; one bottle in each lavatory. No ice is provided.

A few carriages have reversible cushions, the cushion being lined with leather on one side (for summer use) and with cloth on the other side. Some of the corridor cars have counterbalanced windows.

Carriages are given 18 coats of paint. At the carriage works of the L. & N. W. I saw thousands of feet of half-

inch mahogany siding, some of it having been in stock and under cover for four years. The L. & N. W. paint shop has track room for 300 carriages, and about one new carriage is finished every day.

Wagons.—Except in special cases, freight cars have two pairs of wrought-iron spoke wheels and are from 4 to 8 tons capacity. They are from 15 to 18 or 20 ft. long, with sides about 12 in. high, the lading being covered with tarpaulins. Box cars form a very small percentage of the freight equipment. In many cases the roofs of box cars are cut away opposite the doors and this space is covered with a tarpaulin. I made inquiry but failed to ascertain why this was done. [To facilitate work with cranes.—EDITOR.] Many of the coal cars have side doors; their sides are about 30 in. high. Wagons for transporting rails, long timbers, etc., have a false bolster, the bolster being pivoted in the center and the loads resting on these bolsters so as to permit the cars to curve. I noticed several tank cars, with body bolsters riveted to the tank itself, the bolsters being either steel or iron.

Wagons are not equipped with continuous brakes. The brake is generally applied to one wheel only, but never to more than two, and when this is the case, the two wheels on the same side of wagon are braked; no brake beam. The brake lever is one side of car, is about 6 or 8 ft. long and cannot be manipulated except when train is moving slowly enough to allow a man to run along side of car and pull it down. About the only brakes that can be applied when train is running are the one on the engine and the one on the brake van.

The 5-link coupling is gradually disappearing, a 2-link coupling being substituted. It is not necessary to go between the wagons to couple or uncouple, nor is it necessary to couple them as they come together. In coupling and uncoupling the men use a "shunter's stick" about 5 ft. long with a hook in the end to engage the chain; the buffer is used as a fulcrum to assist the shunter in raising the chain and throwing it over the hook of the next car or to disengage the chain from the coupling hook. There is a good deal of slack in freight trains. When a train is stretched the buffers are from 7 to 12 in. apart.

Locomotives.—While the English locomotive looks plainer and the casual observer would think they had fewer parts than the American locomotive, I believe the inside connected engines as used in England have more parts, and if run under the same conditions would cost more for repairs than American locomotives of the same general proportions.

As in America, the tendency is to increase the steam pressure. Engines steam freely; they have splendid fuel, and the draft is not obstructed by netting and draft sheets; no extension fronts. The engines have a much lighter exhaust than ours, and throw very few sparks. No headlights, pilots, bells or seat boxes. Cabs are coming into use, but are not long enough to furnish the protection they should. I saw several shunting engines without even a windguard. Simple engines, both passenger and goods, usually have 18-in. cylinder. Express passenger engines have drivers varying in diameter from 6 to 8 ft. Goods engines usually have 5-ft. drivers; those of heavy mineral engines are generally 4 ft. or 4 ft. 6 in. in diameter. Driving wheels are either of wrought iron or cast steel. Many companies are putting four-wheel trucks under their locomotives. Some few roads are using iron or steel tubes and fireboxes; but copper is the common material. Nearly all locomotives have screw reversing gear. I believe most of the engines on the Caledonian have reverse levers. Engineers stand on left side. [Not universal.—EDITOR.] Engineers watch the water by the water-gage glass; most engines have two gage cocks, but no gage-cock drip pans. There are steps on front or rear of shunting engines. Boiler jackets are painted, each road using a different color. Fire doors open inward and upward. Passenger engines have power brakes on both tender and driving wheels. Goods and shunting engines have hand brakes on drivers and tenders.

Water space of tenders extends under coal bin. Coal boards are sheet iron with small trap door at the floor. Boxes on the tender are made of sheet iron or steel. In some instances the circular ends of water legs of tenders are used as tool and oil boxes, the water space being shortened about 18 in. Track tank scoops are sometimes handled by compressed air or vacuum pressure.

Signals.—With few exceptions, the railroads of Great Britain and Ireland are fully interlocked. For instance, at Kenmare, Ireland, where there are only three trains in and three trains out every 24 hours, the interlocking is as complete as though there were 500 trains a day. Ninety per cent. of main line switches are handled from interlocking machines. Passenger trains are worked under absolute block system. Permissive block working is admissible on freight lines. Single track lines are either worked with the staff or the staff and ticket system. Where there is enough business a signalman looks after the staff machine; otherwise the guard performs this duty. Communication between the towers is had by a code of bell signals, train describers, telephone or telegraph. In some instances there are two or three means of communication between the same towers.

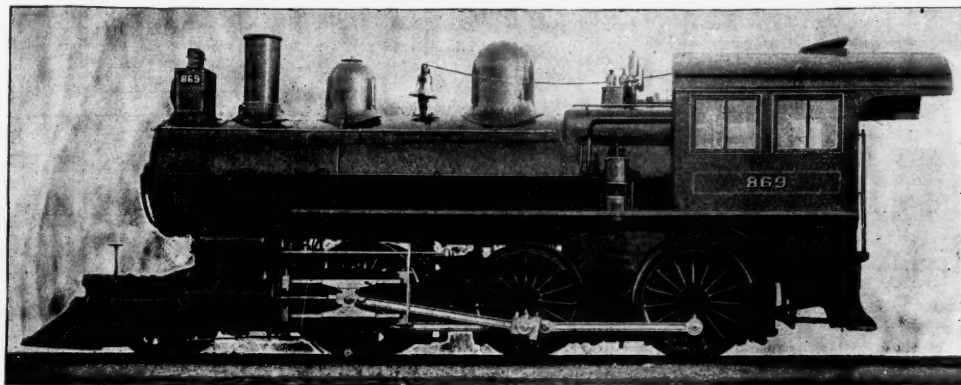
As a rule signals are in very poor adjustment. From my observation if blades are inclined anywhere from 30 to 70 deg., safety is indicated. As far as practicable signals are placed on left side of track they govern, with the blade pointed to the left; top arm applies to the line to the left, etc. Each home signal has its distant signal.

* See Railroad Gazette Oct. 2 and Dec. 17, 1886.

† Or, to put it the other way, \$45 dollars is the average yearly cost of (1) repairs, exclusive of running repairs, and (2) renewals. Deducting from this the known factor, renewals, \$25, we have \$20 as the cost of wear and tear.

Some distant signals are handled more than a mile; 1,200 yards is the average. Signals are handled by a single wire. If necessary, signals are put as high as 40 or 45 ft. above the rail in order to get sky background. Many signals have repeating blades, i. e., a blade placed below the running blade and about 10 ft. above the rail. This is done to enable the driver to see the position of the blade in foggy weather. Some roads use what is termed a "calling on" signal. It is a short blade about 2 ft. long, placed just below the running blade. When the lower blade is pulled it indicates that the train may draw on slowly to the next signal. When signals are located so they cannot be seen from the tower electric repeaters are used.

Some roads use red for danger, green for safety; others use red for danger, white for safety. As a rule



Pennsylvania Two-Cylinder Compound Mogul Locomotive.

back light shows white when signal is at danger, and is obscured when signal is at safety. Where slow running tracks are parallel to fast running tracks, signals for the former are designated by a sheet iron ring fastened to the blade.

Most companies manufacture their own interlocking apparatus. There are many old machines, which have no preliminary locking; tappets are coupled directly to the levers. Channel iron and not pipe is generally used for connecting rods for handling switches. It is claimed that pipe buckles too easily. Detector bars are placed on the inside of the rail. The bar itself is either T or L iron.

Saw no selectors. Facing point switches are rarely handled more than 540 ft. from the tower. Bolt locks are termed detector locks. On some roads sidings leading to the main line are equipped with catch points. In some instances catch points are introduced in the main line to derail wagons running in the wrong direction.

To stop runaway wagons in gravity yards a hook with a 14 or 16-in. radius is used; it is attached to a piece of heavy cable chain about 50 or 60 ft. long. The chain is coiled up in a pit between the rails. The hook is placed in the center of the track and is lifted to engage with the axle of the runaway wagon. The force necessary to drag the chain out of the pit and the friction of the chain on the ties and ballast stops the wagon.

The interlocking machine at Euston station, London, is, I believe, the largest in the world. There are 240 working levers, the levers being in two banks. The train director told me that at times the fog was so thick that the man operating the levers at one end of the machine could not see the man at the other end for hours. The tower is located in the center of the yard. During fogs the shunters use bugles to signal to the drivers and to the men in the tower, the bugles used on one side of the yard being different in tone from those used on the other side. A much-used cross-over about 500 ft. from the tower has a man stationed at it while fogs are on, the duty of this man being to notify the levermen by ringing a mechanical gong located just outside of the tower, when trains are clear of the cross-over or when a train moving toward the tower wants to use the cross-over.

I notice that the English roads make the same mistake that many of us are guilty of—in that they do not provide a signal for every movement.

Miscellaneous.—In the larger cities each railroad has several freight stations. In cities and many of the villages store-door delivery is in vogue. The railroad companies also have their trucks haul merchandise from the stores to the stations. Where consignee unloads freight from cars a demurrage of 3s. per day on wagons and 6d. on tarpaulins is charged after a limited time. Private wagons are charged siding rent.

Horses, turntables and capstans are used for shunting purposes quite extensively, but all new yards are so arranged that locomotives can do the work. Capstans are generally operated by hydraulic or electric apparatus. Cranes for loading and unloading heavy articles are stationed at convenient points about the yards. Many of the freight stations have lifts for placing wagons on the different floors of the warehouse.

The larger roads manufacture most of their material and supplies. At the locomotive shops of the L. & N. W. at Crewe, I not only saw them making 6d. nails, but rolling 90-lb. steel rails, 60 ft. long. They were not only building locomotives, but had a department for the manufacture of artificial limbs. There are 8,000 men, women and boys employed in this shop alone.

Pennsylvania Compound Mogul Locomotive.

The Pennsylvania has lately built several experimental locomotives, and the one shown in the engraving represents a two-cylinder compound mogul which has been built at Altoona from designs of Mr. F. D. Casanave, General Superintendent of Motive Power, to whom we are indebted for the illustrations and information used in this article. The engine has 62-in. drivers and its weight is about 75 tons. If it is adopted as a standard it is probable that this may be somewhat reduced. Some general dimensions are as follows:

Number of tubes.....	279
Length of tubes between sheets.....	11 ft. 8 1/2 in.
Outside diameter of tubes.....	2 in.
Inside length of firebox.....	9 ft.
Inside width of firebox.....	3 ft. 4 in.
Heating surface of tubes.....	1,725 sq. ft.

Heating surface of firebox.....	153 sq. ft.
Total.....	1,878
Grate area.....	29.9
Width of cab.....	9 ft. 7 in.
Height of cab roof from rail.....	13 " 11 "
Spread of cylinders.....	86 in.
Capacity of tender (water).....	3,600 gals.
Capacity of tender (coal).....	15,000 lbs.

More complete dimensions are given in the accompanying line engraving of the engine. The tender is of the usual Pennsylvania type, with two four-wheel trucks.

Railroad Economics.

We have before now stated that Mr. M. W. Acworth has lately delivered a lecture on "Railway Economics." His reasons for doing so are briefly stated below. To some of our British contemporaries it came as a shock that an Oxford Master of Arts should actually have the "side" (to use a convenient Britishism) to stand up in public and say that there is such a thing as a science of railroading; much, we suppose, as Ali-Bey-Kurdi finds it hard to believe that there is such a thing as a railroad. We have seen no full report of the lectures, but get from the London Times what appears to be an intelligent abstract of the first four. This we give below, still further abridged.

In his introductory remarks he said he had accepted the invitation of the London School of Economics to give the lectures because he was deeply convinced of the necessity that railway economics should be recognized as a subject of definite scientific teaching in this country. English railway men hitherto had learnt their profession by rule of thumb, and English railways, if not the best, were certainly among the best in the world. What had been true in the past was rapidly ceasing to be true of the present. In a new subject—that is, one in which there has not been time to accumulate and systematize a body of information and doctrine—a man succeeded best who had most individual enterprise and capacity for profiting by personal experience. But in every pursuit the time came when the accumulated experience of the past got so great that no man, however

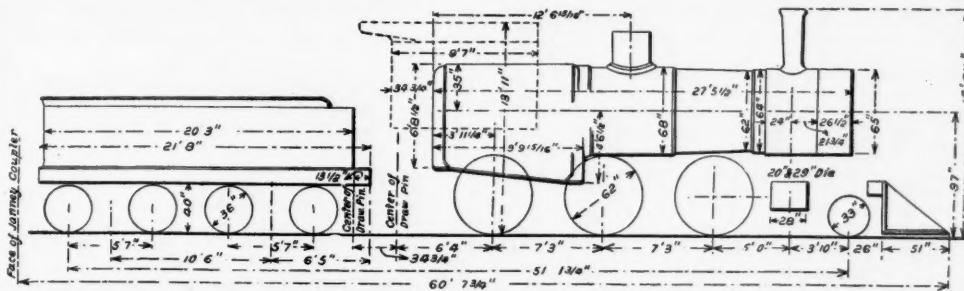
way system in the fact that beyond a certain point increase of size did not tend to reduction of expenses, but rather the reverse. English railways, on the whole, had practically reached a point at which further increase in size would procure no economy. Any further amalgamation would be due rather to reasons of policy and diplomacy, for financial considerations were not everything. Whether, as in France, the "traffic basin" of each railway was geographically defined, or whether competition was recognized as a force in railway affairs, the existence of different railway systems side by side was equally a check on indefinite expansion. When such systems had grown up gradually as in this country there were tacitly recognized bounds within which competition must be confined.

Taking a railway company or railway administration to mean, for practical purposes, a large concern both owning the road and conducting the traffic over it, he said that, according to the analysis of German economists, it might work on three principles—either to make a profit, or simply to pay expenses, or as a public service. The last was purely theoretical; he knew of no actual instance. It was common enough to build railways for strategic purposes. These, however, always charged rates for conveying traffic. They might be built as a public service, but were not worked as such. As to the second way of working, practically no railways were managed so as to return no profit beyond their working expenses and interest on capital. In France and Italy, for instance, the State, which might be called the ultimate owner, did not get full interest on the money sunk, and therefore the railways were not paying expenses. Prussian railways, again, did more than pay interest on their capital, their surplus, amounting to five or six millions sterling, was taken over by the Exchequer, in much the same way as was done by the English Treasury in the case of the Post Office.

The lecturer then discussed the factors which determined railway rates. He pointed out that the "transportation industry" was so much interfered with by legislation that it was hard to say what was the result of economic laws and what the result of artificial regulation. A carrier, free to do what he liked, would fix his charges between the maximum of what he could get and the minimum of what he could afford to work for, and a railway, on which was imposed certain maximum rates, constructed its tariff on the same principles within the limits allowed. A company 50 years ago building a new railway would have its rates on the estimated cost of the line, so as to pay perhaps 5 per cent. But it would probably find that the line cost twice as much as was expected, and therefore it would cast about for ways of increasing its income in order to be able to pay the full interest. Of its working expenses, it would find that about one-half were constant whatever the traffic, while the other half would vary as the traffic. The company would conclude that to gain more it must carry more, and therefore would aim at attracting new traffic of a lower class at lower rates, while continuing to charge the original high rates on the traffic that had shown itself able to bear them. Thus elaborate tariffs would be worked out and a classification of traffic made according to what it would bear. The other principle was to charge according to cost of service, in which case considerations, such as convenient packing, large consignments, etc., were taken into account. In actual fact the classification depended on the competition of these principles, and was a sort of resultant of the two. It was noticeable that a practical railway man was more inclined to go by the first principle, the theoretic person by the second.

In his third lecture Mr. Acworth began by discussing the meaning of the principle of fixing rates according to "what the traffic will bear." This, he said, did not mean charging as much as could possibly be got, and it might almost be stated alternatively as tempering the wind to the shorn lamb. It really meant that a railway, having to raise a certain revenue, raises it by charging each portion of the traffic what it can afford to pay, and not charging it what it cannot. Doctors' fees were calculated on precisely the same principle, and if it were objected that they are private individuals whereas railways are a public function, it might be answered that the public revenue is raised in just the same way. In fact, the principle underlay the conduct of all business, public and private.

On railways it fixed the upward limit of the charges levied, but a railway manager had also to consider the cost of service, of which, roughly, one-half consists of interest on capital, while the other half is divided between expenses which vary with the traffic and those which do not. The form in which English railways publish their accounts makes it difficult to arrive at the cost of conveying a ton a mile in this country, and the lecturer, therefore, had recourse to the work done by Albert Fink on American railways some 20 years ago. He quoted a number of figures illustrating how the expenses of dealing with a ton of goods varied under the different



Pennsylvania Compound Mogul Locomotive.

gifted, could afford to do without it. Railroading had now been reduced to a written science, and would before long be admitted to require a regular technical course of training just as much as brewing or iron-smelting. All over the world, except in this country, it was already so admitted.

With us, though such was not the case in less thickly-populated countries, it was almost an inseparable part of the idea of a railway that it should run on land fenced off and appropriated solely for the purpose. As a natural result of railways having to purchase valuable land on a big scale, as well as to construct expensive works, and spend large sums on engines and rolling stock, railway enterprise implied a great capital, and the lecturer desired to emphasize the point that this capital, from the moment it was invested, became fixed and could not be withdrawn and devoted to any more profitable employment. The conduct of traffic, too, on a railway was essentially a wholesale business both practically and economically.

There was a limit to the possible extension of a rail-

heads of cost of service, according as it was carried over a busy line or the reverse. Thus, on the main line of the Louisville & Nashville, it cost eight times less to move a ton than it did on a certain small branch. In the same way the cost of stations and maintenance of way was much less per ton on busy parts of that line than it was on empty ones, and over some portions the total cost of carrying a ton a mile was 500 times as much as on certain others. Supposing that in England the difference were only 250 instead of 500, it would still be difficult to treat cost of service as the basis for calculation of tariff. In the sense, however, that the joint cost of carrying on a railway as a whole controls the traffic charged as a whole, cost of service might be truly said to influence rates, while, in the second place, it was an inferior limit, below which a railway could not afford to carry goods at all.

In his fourth lecture Mr. Acworth considered the subject of special rates, or rates lower than the normal traffic scale. Desire to increase traffic was one reason for their existence, but they were mainly the result of competi-

tion in one shape or another. Practically it might be said that there were two forms of competition—(1) natural, between different markets and different producing areas, and (2) artificial, between different routes to and from markets and producing areas. The first was illustrated by an example from the meat supply of London, which 60 years ago was fed from the country in its immediate neighborhood. But after the railways were built farmers in Hereford, for instance, found that if they were allowed a special rate, it would pay them to send their animals to London, and in time the same thing happened as regarded Aberdeen. Special rates were thus given to develop the traffic in cattle.

But besides the competition of areas there was competition of means of conveyance. In cases where sea conveyance was possible the special rates were a result of that circumstance. The neighborhood of the sea kept down prices. For example, the rates between New York

The Strength of Flat Boiler Plates.*

Prof. C. Bach, Professor of Mechanical Engineering in the Stuttgart School of Technology, has been conducting for some time a series of tests on flat or plane plates, the results of which he has given in a publication entitled "Versuche über die Widerstandsfähigkeit ebener Platten" (Julius Springer, Berlin). Lately he has issued a book in two parts,† mainly reprints from some of his articles published in the *Zeitschrift des Vereines deutscher Ingenieure* during 1893-4.

The first part consists of a complete report of his late investigations of the strength of flat boiler plates; the second offers new formulæ, derived by him from his ex-

periments, the plate in practice (differences in temperature, etc.), but which could not well be initiated in the experiments.

TEST OF PLATE A, DESIGNED FOR A WORKING PRESSURE OF 142 LBS.

This plate varied in thickness from .74 in. to .756 in., or an average of .748 in.

There were 14 handholes (designated in the plan of Fig. 1 by Roman numerals), 3.937 in. diameter outside and 4.134 in. diameter inside (shown in detail in Figs. 2 and 3). The cuts show clearly the method of closing these holes, the joint being made by means of a rubber ring seen in cross-section in Fig. 1, dotted in Figs. 4 and 5. This style of cover was found to be simple and safe,

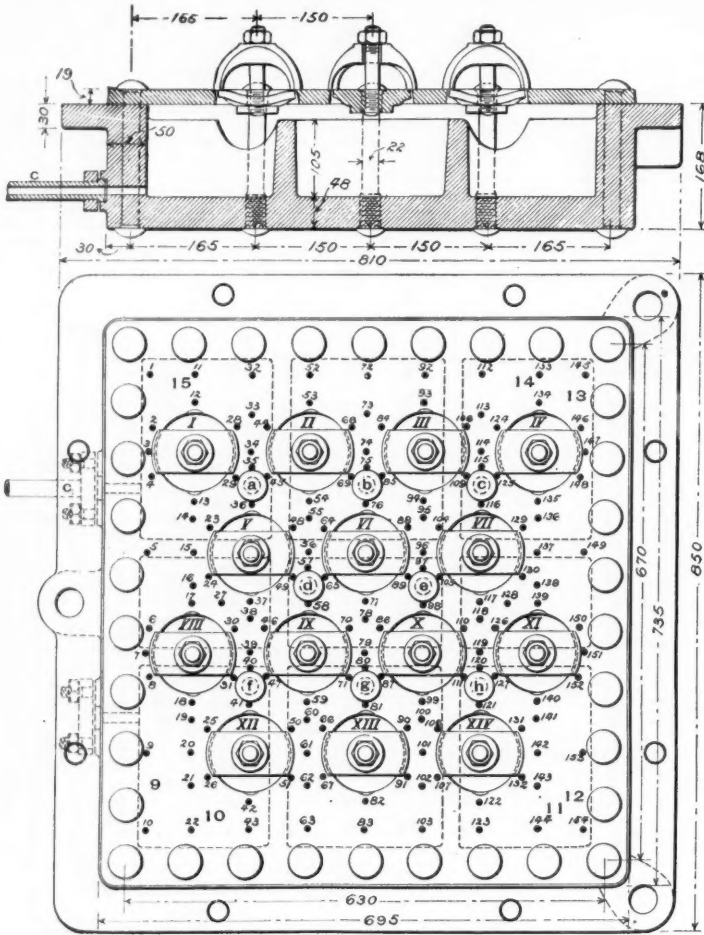


Fig. 1.



Fig. 2.

Fig. 3.

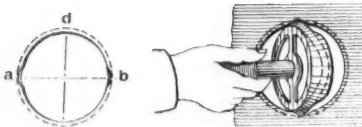


Fig. 4.

Fig. 5.

and San Francisco were kept down by the ocean routes. The rates from New York westward continually rose for about 2,000 miles and then gradually decreased for the remaining distance to San Francisco. Another form of competition was that between rival ports. Thus, the rates charged on potatoes from the Channel Islands between Southampton and London were governed by the rates charged for conveying them all the way by sea. A third form was that of two railway routes. The rate on the railway having the longer route was ruled by that prevailing on the shorter.

Granting that competition was a main, if not the main, factor in settling a tariff, it might be thought desirable to get rid of it altogether. That, however, was impossible. The French railways, for instance, were each apportioned a traffic basin, but, all the same, there was keen competition among them for traffic coming from Italy. It might safely be said that it was almost impossible to imagine the means of conveyance concentrated in one hand over so large an area as to do away with competition completely.

With regard to passengers, railways were always trying to extend their areas of distribution and always charged what the traffic would bear. That was why an excursion ticket to Brighton cost 3s., while one to Skegness, which was very much farther, could be had for 4s. Unless the fare to Skegness were relatively cheaper, the excursionist would refuse to go to Skegness altogether. The same principle held with season tickets. The minimum charge would be the cost of carriage, but this was a very wide term. If a train had to run in any case, any additional traffic was, to a great extent, pure profit. On a big railway even a special train might be run which would cost the company very little for movement, seeing that the engines, etc., were there in any case, and ten extra trains might cost nothing for fixed expenses. But, if the additional traffic necessitated the opening of new lines, or of working a line by night which had hitherto only been worked by day, the cost would become serious. In Europe the practical basis was that rates should cover working expenses as a whole; in America a manager would take new traffic if he thought it would pay actual average movement expenses. It should be noticed that under certain circumstances, to carry goods even at this lowest price might be much more profitable than to refuse the traffic altogether.

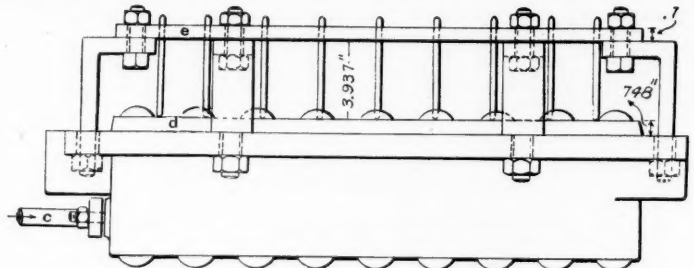


Fig. 6.

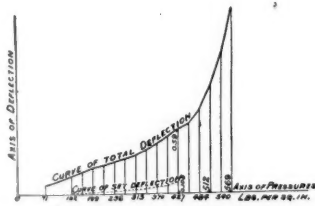


Fig. 7.

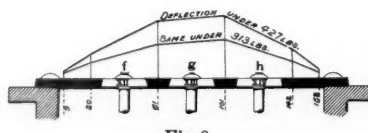


Fig. 8.



Fig. 9.

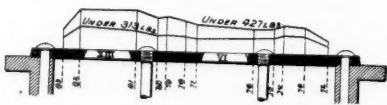


Fig. 10.

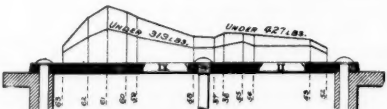


Fig. 11.

periments, whose practicability and accuracy he tests in connection with a discussion of results obtained from late tests made in the same line by the German Government.

That which follows is a translation of the more important parts of his later work, and will we trust, prove both interesting and instructive to many of our readers.

PART I.—WATER CHAMBER PLATES OF TUBULAR BOILERS. The South German Tubular Boiler Works of Frankfurt-on-the-Main furnished for test two samples of flat plates such as used in their water chambers; one for a working pressure of 142 lbs. (10 kg. per sq. c. m.), the other 114 lbs. (8 kgs.) per square inch.

Each plate had been finished for the erecting shop, and in the test all elements of the design were maintained as far as possible, in that not only the thickness of the plates, but the style and amount of bracing, handholes, riveting, etc., agreed perfectly with practice.

Finally, in conclusions based on the results of experiment, due regard was paid to influences which surround

holding as well as could be expected under the great deflections to which the plate was subjected.

The plate was supported by 34 rivets outside of and 8 stay bolts within the pressure area. The latter are designated by letters a, b, c, etc. The pressure box, upon which the plate to be tested was fastened, was made of cast iron of the dimensions given and of the form shown in Fig. 1. The ample ribs provided against deformation rather than for mere strength. Water pressure was introduced through pipe c.

To determine the amount of deflection under pressure—the real object of the test—measurements were taken at 154 points carefully selected with regard to handholes and supports. These points are designated in Figs. 1 and 6 by Arabic numerals 1 to 154. Each handhole is surrounded by six points of measurement which lie at the apices of a regular hexagon inscribed in a concentric circle of 4.96 in. Besides these such other points were chosen at which it was expected deflections of significance in studying the deformation of the plate would occur.

Special attention is directed to the care exercised in numbering points of measurement successively, in order,

* Translated and condensed from the German by Mr. W. W. Nichols, M. E., Instructor in Mechanical Engineering, Yale University.
† Versuche über die Widerstandsfähigkeit von Kesselwandungen von C. Bach. Berlin, Julius Springer.

that chances of omission may be reduced to a minimum. The importance of this is made manifest when it is remembered that for each pressure at least two measurements—one to determine the amount of deflection under the pressure, the other, after the release of this pressure, to determine the set if any—had to be taken, which for the whole plate therefore amounted to 308 measurements; for a complete test of each plate some 5,400 were taken altogether. This included, however, beside the recorded measurements, many repeated to ensure accuracy. A

Staybolts *d, e, f, g* and *h* belong to the sections under discussion. The set in the staybolts, being assumed equal to the mean of the set deflections at the surrounding points of measurement, always became decidedly pronounced when the pressure upon the plate exceeded 340 lbs. (Staybolt *e* formed one exception to this rule; its record otherwise was so questionable that it has been omitted altogether in the discussion.) It was decided, therefore, that at this pressure the yield-point of the staybolts had also been exceeded, which agrees

closely with the results of the tensile test of this staybolt iron. A working pressure of 142 lbs. on the plate would accordingly amount to 32,700 $\times \frac{1}{11} = 10,850$ lbs. stress on the staybolts; rather it would be more than this, because the deflections of the plate being much less at 142 lbs. than at 340 lbs., the stress on the staybolts in the former will be proportionately greater. From this it is seen that the staybolts are severely strained. Since, however, a first-class metal is always employed for staybolts, with the margin thus afforded it is not at all likely that the yield-point will ever be reached in present practice.

When the plate becomes arched—provided the metal can be bent to such an extent without serious injury—it possesses, by virtue of this form, a much greater strength of resistance than when flat. It is believed on that account that a much greater ultimate pressure than that ever reached in the tests—981 lbs.—could have been imposed without

obtained. Finally at 981 lbs. the element of time became so important that deflections were no longer measured.

A tensile test of the samples of boiler plate gave the following:

No.	Breadth. In.	Thick-ness. In.	Co-effi-cient of elastic-ity. Lbs. per sq. in.	Elastic limit. Lbs. per sq. in.	Yield-point. Lbs. per sq. in.	Ultimate load. Lbs. per sq. in.	De-crease in cross-section. Per cent.	Elongation in 7.87 in. Per cent.
9	1.102	.748	29,867,900	17,350	31,860	44,660	8	5.25
10	1.181	.748	28,872,300	16,790	28,870	47,930	20.1	21.1
11	1.181	.752	.....	.....	.....	48,530	5	4.9
12	.972	.740	30,209,250	16,640	28,450	45,190	18.5	18.45
13	1.063	.716	28,943,200	19,490	29,440	47,660	17.1	17.5
14	1.181	.716	.....	.....	.....	43,190	9.1	8.6
15	1.192	.728	.....	.....	.....	.....	.....	.....
16	1.188	.743	.....	.....	.....	.....	.....	.....

REMARKS: No. 12 showed in the fracture a defect near the surface. From the test it would appear that Nos. 10, 11, 14 and 15 were pulled in the direction of the rolling of the sheet, while Nos. 9, 12, 13 and 16 were pulled across this direction.

The tensile test of staybolt iron gave the following:

Diam. In.	Coefficient of elasticity. Lbs. per sq. in.	Elastic limit. Lbs. per sq. in.	Yield-point. Lbs. per sq. in.	Ultimate load. Lbs. per sq. in.	De-crease in cross-section. Per cent.	Elongation in 7.87 in. (200 m.m.) Per cent.
.649	30,948,890	28,160	32,850	50,190	51.	24.4
.649	31,105,280	29,360	33,850	50,040	53.	24.1

TEST OF PLATE B, DESIGNED FOR 114 LBS. WORKING PRESSURE.

Mean thickness .75 in. Other differences between this plate and *A* are fully shown in Fig. 12. The former, it is seen, is considerably larger and has more hand-holes which, as well as the stay bolts, are differently disposed. The deflections were measured at 98 points; the methods of test were the same as those employed with plate *A*.

In this sheet set was first discovered in most cases under about 200 lbs. (14 kgs.) pressure.

Complete results for all points, together with graphical representations for 28 of the points of measurement, are exhibited in the original work. We shall omit them, contenting ourselves by giving cuts (Figs. 13, 14, 15 and 16) which show graphically the effect at four sections under two pressures, viz., 200 lbs. and 370 lbs., perhaps the elastic limit and yield-point for the plate generally.

Tensile test of strips, taken from the original sheet near the corners of plate *B* and designated by large Arabic numerals to agree with those of Fig. 12, gave the following results:

Number.	Breadth. Inches.	Thick-ness. Inches.	Ultimate load. Pounds. per sq. in.	Decrease in cross-section. Per cent.	Elongation in 7.87 in. (200 m.m.) Per cent.
1.....	1.2	.752	40,000	8.6	14.6
2.....	1.141	.75	43,380	17.1	16.2
3.....	1.189	.756	48,360	16.7	32.6
4.....	1.185	.756	49,540	16.4	26.7
5.....	1.185	.748	43,720	6.5	11.8
6.....	1.126	.748	40,210	9.6	10.2
7.....	1.173	.729	46,410	12.3	31.7
8.....	1.177	.733	46,010	18.8	31.7

PART II. THE CALCULATION OF FLAT OR PLANE BOILER WALLS SUPPORTED BY BRACES OR STAYBOLTS AND THE RESULTS OF THE LATEST EXPERIMENTS.

The Hamburg rule of 1891:

$$(1) \quad s = e \sqrt{\frac{p}{k_2}} + c_1, \text{ or}$$

$$(2) \quad p = \left(\frac{s - c_1}{e} \right)^2 \frac{k_2}{c}. \text{ In which}$$



Fig. 13.

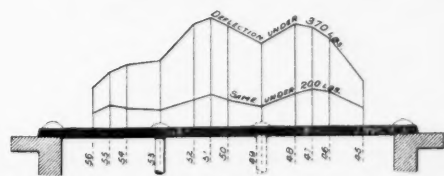


Fig. 14.

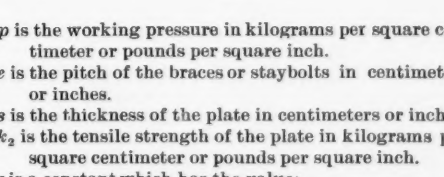


Fig. 15.

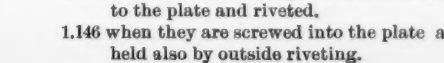


Fig. 16.

p is the working pressure in kilograms per square centimeter or pounds per square inch.

e is the pitch of the braces or staybolts in centimeters or inches.

s is the thickness of the plate in centimeters or inches.

k₂ is the tensile strength of the plate in kilograms per square centimeter or pounds per square inch.

c is a constant which has the value:

1.47 when the braces or staybolt are screwed into the plate and riveted.

1.146 when they are screwed into the plate and held also by outside riveting.

plate, *e e*, Fig. 6, 7 inches thick, was fastened rigidly 3.937 inches above the plate *d d* under test. Through holes in the former plate little rods rested upon the 154 designated points of the test plate. These little rods furnished a ready means of measuring the amount of deflection. Holes were also cut in *e e* in order that the hand-hole covers could be reached as occasion required.

Test pieces of the sheet from which the test plate had been formed, as well as specimens of the staybolt iron, were obtained in order that the quality of the metal could be determined by tensile and other tests. The test strips of the sheet were taken as near as possible to corners 9, 11, 13 and 15, Fig. 1.

The temperature was maintained during the test at about 65 degs. Fahr. (18 degs. to 20 degs. C.). In the first place the distance of the rods above the plate *e e*, Fig. 6, was measured by Professor Bach and then independently by his assistant. Hydraulic pressure was then exerted upon the plate and the corresponding deflections at certain intervals of pressure measured and recorded. These intervals of pressure depended on circumstances—at first, two intervals of 5 kgs. (about 71 lbs.) each, then a release to get set; then intervals of 2 kgs. (about 28 lbs.) additional followed, a release being made after each pressure. At high pressures, when the yield-point had been exceeded pressure was maintained constant, the increasing deflections being measured from time to time.

The greatest deflections were found at the points 50, 51, 59, 60, 61, 62, 66, 67, 70, 71, 77, 78, 79, 80, 81, 86, 87, 90, 91, 99, 100, 101, 102, 106 and 107. The total and set deflections at each of these points are graphically described by curves, two of which are given in Fig. 7, for point 50, as an illustration.

In every case set did not become appreciable until 340 lbs. per square inch (24 kg. per sq. c. m.) had been reached, in other words, until the working pressure for which the plate had been designed had been exceeded 2.4 times.

Since at the yield-point of the plate—370 lbs.—leaks did not appear around the staybolts, notwithstanding the considerable increase in set, it was concluded that this yield-point corresponded closely with that of the staybolts; that is to say, a fluid pressure on the plate of 370 lbs. per square inch corresponded to a total stress on the staybolt of over 32,700 lbs.

producing rupture. Leaks which appeared under the deformation produced by such a heavy stress rendered further investigation impossible.

The total deflections of the plate are approximately represented by right lines up to a pressure of 313 lbs. From that point on deflections increased much more rapidly than the pressure.

Figs. 8, 9, 10 and 11 show graphically the different effects in different cross-sections of the plate. The greater effect in Fig. 8 is due to the greater remoteness of the points of support than in the other cases.

At times during the tests hand-holes leaked and it was found that the repairs this occasioned appreciably

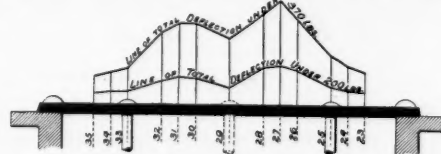


Fig. 13.

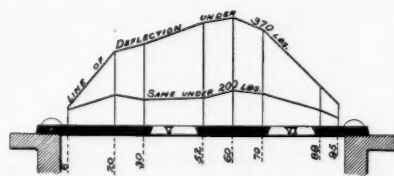


Fig. 14.

affected the magnitude of succeeding deflections, but to an unimportant extent, amounting ordinarily in any case to never more than .0004 inches.

Inequalities in the plate's surface undoubtedly account for some of the unexpected results obtained, but in no case were discrepancies sufficient to seriously affect conclusions.

After the yield-point had been exceeded, deflection under constant pressure increased with the time. And as the measurement of 154 deflections sometimes consumed several hours, beyond the yield-point only successive instead of simultaneous values of deflections could be

1.085 when they are fastened as in Fig. 19, diameter of washers at least $.4e$, their thickness at least $\frac{1}{8}e$, and more if the diameter of the washers is more than one and a half times that of the nuts measured diagonally.

.962 when they are fastened as in Fig. 20, the thickness of riveted washers being at least $\frac{1}{8}e$ and a diameter of at least $.6e$.

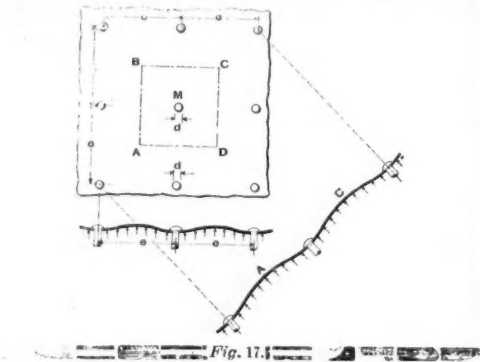
the constant which has the value:

0.15 c. m. or .059 in. when the plate is exposed to flame or heated gases on one side and water on the other.

0.30 c. m. or .118 in. when exposed to flame or heated gases on one side and steam on other, there being no deflectors interposed between flame and plate, and 0 when not exposed.

In the author's calculations it has been assumed that the plate is divided into square fields or sections supported by braces or staybolts, (Fig. 17.)

The following formulæ were then obtained; the symbols are given in the cuts except k_b , which is the modulus of proof strength or the load per unit cross-section required to strain the material to its so-called elastic limit:



tion required to strain the material to its so-called elastic limit:

To s should be added the constant c_1 , defined above.

(a) Braces fastened as in Fig. 18:

$$(3) \quad K_b = \frac{1}{4} \frac{1}{1 - 0.7 \frac{d}{e}} \left(\frac{e}{s} \right)^2 p, \text{ or,}$$

$$(4) \quad p = 4 \left(1 - 0.7 \frac{d}{e} \right) \left(\frac{s}{e} \right)^2 K_b.$$

(b) Braces fastened as in Fig. 19:

$$(5) \quad K_b = \frac{1}{4} \frac{1 - 1.8 \frac{d}{e}}{1 - 0.7 \frac{d}{e}} \left(\frac{e}{s} \right)^2 p, \text{ or,}$$

$$(6) \quad p = 4 \frac{1 - 0.7 \frac{d}{e}}{1 - 1.8 \frac{d}{e}} \left(\frac{s}{e} \right)^2 K_b.$$

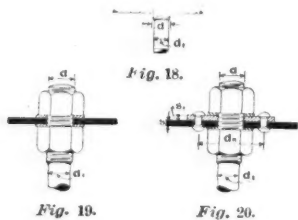
(c) Braces fastened as in Fig. 20:

$$(7) \quad K_b = \frac{1}{4} \left(1 - 0.9 \frac{dn}{e} \right) \left(\frac{s}{e} \right)^2 p, \text{ or,}$$

$$(8) \quad p = 4 \left(\frac{1}{1 - 0.9 \frac{dn}{e}} \right) \left(\frac{s}{e} \right)^2 K_b.$$

These equations have been deduced in the following manner:

Brace M , Fig. 17, sustains a pressure over the sectional area $e^2 - \frac{\pi}{4} d^2$ sq. in. $A B C D$ equal to $p \left(e^2 - \frac{\pi}{4} d^2 \right)$ lbs.* If d_1 is the smallest diameter of the brace then the



stress upon it per square inch will be

$$\sigma_2 = \frac{\left(e^2 - \frac{\pi}{4} d^2 \right) p}{\frac{\pi}{4} d_1^2}$$

or since ordinarily $\frac{\pi}{4} d^2$ is very small compared with e^2

$$\sigma_2 = \frac{e^2 p}{\pi d_1^2} \text{ approximately.}$$

If brace M be considered as sustaining a pressure p on $A B C D$ separated from the surrounding sheet, the

* The braces of the outside sections, those sections partly supported by the outside rivets or screws of small pitch, are loaded much less for equal values of e .

bending moment with respect to the diagonal $A C$ or $B D$ will be

$$\frac{1}{8} e^2 p \cdot \frac{1}{8} e \sqrt{\frac{1}{2}} \text{ or } \frac{\sqrt{2}}{12} e^3 p.$$

But as section $A B C D$ is connected to the remainder of the plate, it is bulged by the pressure in the manner shown in the cross-section, Fig. 17. Consequently the true value of the moment will be less than that given

above, and may be represented by $\mu \frac{\sqrt{2}}{12} e^3 p$ where μ is a constant in value always less than 1. Then

$$(10) \quad \frac{\sqrt{2}}{12} e^3 p \mu = \frac{1}{8} K_b (e \sqrt{2} - d) s^2 *$$

μ , like all co-efficients of this character, can be definitely determined by experiment. The author's experiments have generally fixed the value at $\frac{1}{2}$, which reduces

$$(10) \text{ to } e^2 p = 4 \left(1 - 0.7 \frac{d}{e} \right) K_b s^2 \text{ from which (3) and (4) are derived.}$$

If the brace be fastened in the manner shown in Fig. 19 the moment will be considerably diminished because of additional support furnished by nuts and washers. If it is assumed that the resistance of half the brace (the division formed by the diagonal $A C$) amounting to $\frac{1}{2} e^2 p$ acts at the center of gravity of the half circle of diameter $2d$ or $\frac{4d}{3\pi} = .42d$ from the center of M , in place of

(10) we shall have

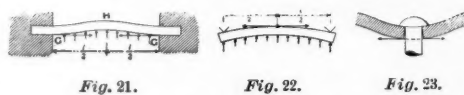
$$(11) \quad \frac{1}{8} e^2 p \left(\frac{1}{8} e \sqrt{\frac{1}{2}} - .42d \right) \mu = \frac{1}{8} K_b (e \sqrt{2} - d) s^2 \text{ or with } \mu = \frac{1}{2}, e^2 p \left(1 - 1.8 \frac{d}{e} \right) = 4 \left(1 - 0.7 \frac{d}{e} \right) K_b s^2$$

from which are derived equations (5) and (6).†

If the brace be fastened as in Fig. 20, the outside riveted washer being about s' in thickness, the lever arm would be diminished by $\frac{1}{8} e^2 p \frac{2dn}{3\pi} = \frac{1}{8} e^2 p .21dn$ and the thickness of the cross-section is increased by s' at the line $A C$. There is a loss, however, of that amount of metal cut away in the hole for the brace, which, it is assumed, is compensated for by the increase in thickness.† Accordingly we have

$$(12) \quad \frac{1}{8} e^2 p \left(\frac{1}{8} e \sqrt{\frac{1}{2}} - 0.21dn \right) \mu = \frac{1}{8} K_b (e \sqrt{2} - d) s^2 \text{ or with } \mu = \frac{1}{2}, e^2 p \left(1 - 0.9 \frac{dn}{e} \right) = 4 K_b s^2 \text{ from which (7) and (8) are derived.}$$

The cross-section in Fig. 17 clearly shows the points of inflection which occur in the curves between the points of support. The case is like that of a beam uniformly loaded along its length and fixed at both ends (Fig. 21), strained greatest near the ends and not at the point of maximum inflection; the bending moment at G , Fig. 21, it is well known, is $\frac{pl^2}{12}$, while that at H is $\frac{pl^2}{24}$; in other words, in case the cross-section is symmetrical with respect to the neutral axis, the strain at the former point



is twice that at the latter. Since tensile strength is usually less than compressive, the lower fibers at G are the weakest, and therefore the most dangerous. If the ends were free, as in Fig. 22, the maximum bending moment is $\frac{pl^2}{8}$, and at the point of maximum deflection.

Now, with reference to Fig. 17, the greatest strains are in the region of the points of support, and not in the regions of the maximum deflection; and the inner fibers—those contiguous to the acting fluid—in the former regions are the most dangerous (Fig. 23).† From this it is concluded that the reinforcement of Fig. 20 can be made very effective.

[TO BE CONTINUED.]

* (Bending Moment) $M = \frac{K_b I}{c}$, I being the moment of inertia referred to center of gravity and c the distance of the farthest fiber from the neutral axis. The cross-section being rectangular and b s in area $\frac{I}{c} = \frac{b s^2}{6} = \frac{(e \sqrt{2} - d) s^2}{6}$; hence (10). [E.D.]

† The same reasoning applies to the form in Fig. 18. If it is desired to refine the process to an extent not attempted above, the same steps which lead up to the form of (11) should be taken, but for $e^2 p$ should be substituted $(e^2 - \frac{\pi}{4} d^2) p$. Then, assuming that the resistance of the staybolt acts at the center of gravity of its half section or $.21d$ from its center—

$$\frac{1}{8} (e^2 - \frac{\pi}{4} d^2) p \left(\frac{1}{8} e \sqrt{\frac{1}{2}} - .21d \right) \mu = \frac{1}{8} K_b (e \sqrt{2} - d) s^2$$

$$K_b = \mu \frac{\left[1 - \frac{\pi}{4} \left(\frac{d}{e} \right)^2 \right] \left(1 - 0.9 \frac{d}{e} \right)}{1 - 0.7 \frac{d}{e}} \left(\frac{s}{e} \right)^2 p \text{ in which } \mu$$

will be larger than in (11).

‡ The effect of the reinforcement of the plate by a riveted washer of a thickness $\frac{1}{8}e$ or more can be determined by comparing, for the different cross-sections, their different moments of inertia. The assumptions made above give smaller and therefore safer values for p and wonderfully simplify calculations. And experiments demonstrate, as they should, that this margin for safety in the case of designs like Fig. 20 afforded by equations (7) and (8) is relatively greater than that for cases like Fig. 19 by equations (5) and (6).

* In a footnote, Prof. Bach directs special attention to the errors inherent in Clark's formula, which have recently been published in German in Hader's *Bau und Betrieb der Dampfmaschinen*. According to these formulae, the strength of flat plates varies directly as s and indirectly as e . Prof. Bach's experiments of 1889-90 prove this incorrect.

Train Accidents in the United States in November.

COLLISIONS.

REAR.

2d, 1 a. m., on Chicago & Alton, at Gardiner, Ill., a passenger train ran over a misplaced switch and into the rear of a freight train which was entering a side track, and the engine and several cars were wrecked. The fireman was killed.

2d, on Delaware, Lackawanna & Western, near Montville, N. J., a work train with platform cars in front and the engine at the rear, ran into the rear of a preceding work train, wrecking a caboose. Several workmen were slightly injured. There was a dense fog at the time, and it appears that the only signal put out by the first train to warn the second was a torpedo; this was exploded by the platform car, but the engineman was so far back that he did not hear the detonation.

3d, on International & Great Northern, near Grape-land, Tex., a freight train which had stopped to cool a hot box was run into at the rear by a following freight, wrecking caboose and two cars. A man in one of the cars was injured.

6th, 8 p. m., on Pennsylvania road, at Parkerford, Pa., a passenger train ran into the rear of a preceding freight which was going into a side track, badly damaging several cars. The engineman was injured. There was a dense fog at the time.

7th, on Ohio River road, near Waverly, W. Va., rear collision of freight trains, injuring two tramps.

8th, on Missouri Pacific, at Ramapo, Kan., a freight train broke in two on a descending grade, and the rear portion afterward ran into the forward one, wrecking several cars. A tramp was killed.

9th, on Lake Erie & Western, near Dayton Hollow, Ind., a freight train descending a grade broke in two and the rear portion afterward ran into the forward one, wrecking 15 cars. A tramp was fatally injured.

10th, on Pittsburgh & Western, at Youngstown, O., a freight train ran into the rear of a preceding freight, wrecking the caboose. The conductor was killed.

12th, on Southern Railway, near America, Ala., a freight train ran into a work train, wrecking a caboose in which a number of laborers were asleep. Four of these men were killed and two other laborers; an engineer and a fireman were injured.

13th, on Delaware, Lackawanna & Western, near Short Hills, N. J., a freight train ascending a grade broke in two and the caboose and three cars ran back down grade at high speed and into the head of a following passenger and milk train. Three freight cars and the milk-train engine were demolished, and all the combustible portion of the wreck was burned up. It is said that the woodwork was ignited both from the locomotive firebox and from the stove in the caboose. The engineman was killed.

15th, on Cleveland, Lorain & Wheeling, at Warwick, O., a freight train which had been stopped was run into at the rear by a following freight, wrecking several cars. The conductor and rear brakeman, who were asleep in the caboose, were killed. It is said that the engineman signaled to them by whistle to put out a flag, but they did not hear the signal.

16th, night, on Chicago & Erie, near Lima, O., a freight train ran into the rear of a preceding freight, making a bad wreck; engineman and fireman injured. It is said that the flagman went back with a red light, but that the light went out.

18th, on Central of Georgia, at Union Springs, Ala., a passenger train ran over a misplaced switch and into some freight cars standing on a side track, making a bad wreck. The fireman, the mail clerk and 5 passengers were injured.

19th, on New York & Brooklyn Bridge Railroad, at Brooklyn, N. Y., a passenger train approaching the terminus was not properly controlled and ran into the rear of a preceding passenger train, crushing the platforms of two cars. One passenger and one employee were fatally injured, and two other persons less severely. There was a dense fog at the time.

22d, on Baltimore & Ohio, at Terrill's, Pa., a freight train broke in two, and the rear portion afterward ran into the forward one, wrecking 14 cars. A brakeman was injured.

25th, on Illinois Central, at Lamar, Miss., a passenger train ran into a freight car which had been blown out of a siding upon the main track. The engineman and fireman were killed.

25th, on Pittsburgh, Cincinnati, Chicago & St. Louis, near Steubenville, O., a freight train descending a grade broke in two, and the rear portion afterward ran into the forward one in a tunnel; several refrigerator cars loaded with beef were wrecked, and the road was blocked 15 hours.

25th, on Pittsburgh, Fort Wayne & Chicago, at Richey, O., a freight train broke in two, and the rear portion afterward ran into the forward one, wrecking 8 cars. Two trainmen and 3 drivers were injured.

25th, on Union Pacific, near Easton, Kan., a mixed train broke in two, and the rear portion, a single passenger car, afterward ran into the forward one, doing considerable damage. The conductor jumped off and was injured.

26th, on New York, Lake Erie & Western, near Watt's Flats, Pa., a freight train ran into the rear of a preceding freight, wrecking caboose and 2 cars. A conductor was injured.

26th, on Cincinnati, Hamilton & Dayton, near Lima, O., a passenger train ran into some freight cars which had been blown out of the side track by a high wind; engineman and fireman injured.

26th, on Great Northern, at Spicer, Minn., a freight train ran into the rear of a preceding freight, making a bad wreck. The engine of a third freight train standing on a side track was also wrecked and its engineer injured. Two firemen were also injured. The wreck caught fire and a portion of it was burned up.

26th, on Baltimore & Ohio, near Belvidere, Md., a freight train standing at the station was run into at the rear by a following freight, wrecking several cars. A brakeman was injured.

27th, 3 a. m., on Pennsylvania road, at Adamsdale, Pa., a freight train ran into the rear of a preceding freight, wrecking several cars. Two trainmen were injured.

And 16 others on 15 roads, involving 2 passenger and 23 freight and other trains.

BUTTING.

4th, 7 a. m., on St. Louis, Iron Mountain & Southern, near Little Rock, Ark., butting collision between passenger train No. 55 and a stock train, making a bad wreck. The men on the engines jumped off and were but slightly injured, but the men in the baggage cars were pinned down in the wreck for an hour. The freight had been stopped by the breakage of a drawbar and a flagman had been sent forward to stop the passenger train, but failed to do so.

6th, 2 a. m., on Cincinnati, Hamilton & Dayton, at Wapakoneta, O., a northbound passenger train ran over a misplaced switch and into the head of a south-

bound freight train standing on the side track, damaging both engines and injuring an engineer.

9th, on Philadelphia, Wilmington & Baltimore, at Elkton, Md., a northbound freight standing on the southbound track was run into by a southbound freight, making a bad wreck. A tramp was injured.

10th, 10 p. m., on Louisville & Nashville, near Franklin, Tenn., butting collision between a passenger train and a freight, badly damaging both engines and one mail car. The engineer and fireman of the passenger train were killed.

13th, on Terminal Railroad tracks, at East St. Louis, Ill., butting collision of freight trains, making a bad wreck; one engineman and one fireman injured.

13th, on St. Louis, Chicago & St. Paul, near Clifton Terrace, Ill., butting collision between an empty engine and freight trains, damaging both engines, one of which was derailed; the other one, which had been reversed and deserted, ran back uncontrolled to Alton where it collided with a switching engine. The first collision was due to the error of the engineman of the empty engine, whose watch was one hour fast.

14th, on Cleveland, Cincinnati, Chicago & St. Louis, at Muncie, Ind., butting collision of freight trains, badly damaging both engines. One engineman was injured.

15th, on Chicago, Milwaukee & St. Paul, at Summit, Minn., butting collision of freight trains, killing one engineer and injuring a trainman.

16th, 4 a. m., on Fall Brook Railroad, near Jersey Shore Junction, Pa., butting collision of freight trains, making a bad wreck. One fireman was crushed and forced into the firebox where his body was nearly burned up. Three other trainmen were injured. The wreck caught fire and was badly damaged. It is said that the southbound train had orders to meet three sections of a northbound, but started out after the second one had passed.

25th, on Atchison, Topeka & Santa Fe, near Shoemaker, N. M., butting collision between the eastbound Chicago limited express and a westbound passenger train, wrecking both engines, the baggage car and several freight cars and overturning a passenger car, which fell into a river. Two mail clerks were killed, freight conductor and newsboy fatally injured, 6 other employees and 10 passengers less severely hurt.

28th, 1 a. m., Chicago, Milwaukee & St. Paul, near Stoughton, Wis., butting collision between an eastbound passenger and a westbound freight train, wrecking both engines and several cars. One engineman and a mail clerk were injured. It is said that an operator failed to deliver an order to the passenger train.

And 4 others on 4 roads, involving 8 freight trains.

CROSSING AND MISCELLANEOUS.

2d, on Boston & Maine, at Edgeworth, Mass., a passenger train ran into a freight train which was switching on the main track, and several freight cars were wrecked. A freight brakeman was killed and 5 employees and 6 passengers were injured. The freight encroached upon the passenger train's time without putting out an adequate signal.

4th, 7 a. m., near Dallas, Tex., a passenger train of the Missouri, Kansas & Texas was run into by a passenger train of the Atchison, Topeka & Santa Fe at the crossing of the two roads, the M. K. & T. baggage car being overturned and the Atchison engine derailed; but no one was hurt or injured. The M. K. & T. engineman, foreseeing the collision, stopped the baggage car on the crossing so as to save the passenger cars. Several passengers were slightly injured.

4th, on Pennsylvania road, at Florence, N. J., collision between a passenger train and a freight, derailing both engines. One engineman was injured.

9th, on Lehigh Valley, near Wilkes-Barre, Pa., a heavy coal train ascending a steep grade broke in two; there was an engine at the rear of the train which seems to have been depended upon to some extent for brake power, but in this case the cars became uncontrollable, and ran back down grade at high speed. The brakeman and fireman jumped off, but the engineman stuck to his post. He applied several brakes on the cars and sounded the whistle as a warning to a train which was following this one up the grade. This expedient was successful, the men on that train having been able to jump off in season, as also did the man who gave the warning. Both engines and 26 cars were wrecked by the collision that followed.

13th, on Houston & Texas Central, at Bremond, Tex., collision between a passenger train running at high speed and a locomotive of the Waco & Northwestern, wrecking both engines. One engineman was killed and the other injured.

17th, 2 a. m., on Missouri Pacific, at Leavenworth, Kan., a switching engine ran over a misplaced switch and into a freight car, making a bad wreck. It is said that the switch had been maliciously misplaced, and that the same crime had been committed twice before during the same night.

17th, on Southern Railway, near Corona, Ala., the caboose and 2 cars of a freight train on an ascending grade broke away and ran back into the head of a passenger train, striking it at very high speed and making a bad wreck. A man on the freight cars was killed.

19th, 5 p. m., on Central of New Jersey, at Plainfield, N. J., a freight train coming out of a siding was struck diagonally by a rapidly moving freight on the main track, making a bad wreck. One brakeman was injured.

27th, on Allegheny Valley, at 51st street, Pittsburgh, collision between passenger train No. 25 and freight train No. 64, damaging caboose and 2 freight cars. The caboose took fire and was considerably damaged. The baggage master was injured.

28th, on Lehigh Valley, near Wilkes-Barre, Pa., collision of locomotives, injuring two firemen.

And 15 others on 9 roads, involving 6 passenger and 22 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

1st, on Iowa Central, near Grinnell, Ia., a passenger train was derailed by a broken rail and the engine was overturned. The engineman was badly injured.

3d, 10 a. m., on Missouri, Kansas & Texas, near Waxahatchie, Tex., a passenger train was derailed by a loose or broken rail, and the engine and 4 cars were derailed. The engineman was killed and 23 passengers were injured.

13th, on Michigan Central, near Auburn, Mich., a passenger train was derailed by a broken rail and the cars were overturned. The conductor and one passenger were injured.

And 4 others on 4 roads, involving 1 passenger train and 3 freight trains.

DEFECTS OF EQUIPMENT.

1st, on Birmingham Mineral, near McAdory, Ala., a freight train was derailed by a loose wheel and 4 cars of coal were wrecked. A brakeman was injured.

3d, 10 a. m., on Baltimore & Ohio, at Elm Grove, W. Va., passenger train No. 103 was derailed by the breaking of the flange of a wheel of the smoking car, and the engine and baggage car fell down a bank. Two passen-

gers were killed and 25 injured. Fire started from the stove in the buffet of the parlor car, and also, it is said, from a lamp at the other end of the same car, but the flames were quickly extinguished.

16th, on Philadelphia & Reading, near Reading, Pa., a freight train was derailed by the breaking of a truck, and 6 cars were derailed. A man stealing a ride was fatally injured.

20th, on Lehigh Valley, at Quakake, Pa., a freight train was derailed by a broken axle and 70 cars of coal were wrecked. A brakeman who jumped off was injured.

23d, 2 a. m., on Norfolk & Western, near Patrick, W. Va., a freight train was derailed by a broken axle and the engine and 10 cars were wrecked. A tramp was injured.

And 12 others on 9 roads, involving 1 passenger train and 12 freight and other trains.

NEGLIGENCE IN OPERATING.

4th, on Great Northern, near Ashby, Minn., the engine and first three cars of a passenger train were derailed by an unfastened switch and ditched. The baggage car was injured.

6th, 9 a. m., on Raritan River Railroad, at South River, N. J., the engine of a passenger train ran into an open draw and fell into the river. The conductor jumped into the water and was nearly drowned. There was a dense fog at the time of the collision. The engineman jumped off and was injured.

7th, 6 a. m., on Chicago & Northwestern, at North Evanston, Ill., a passenger train was derailed at a misplaced switch and the engineman was injured. There was a dense fog at the time; this train should approach the switch in question on the third track, and the switchman set the switch for that track, but on this occasion the train was on the second track.

8th, 3 a. m., on Louisville & Nashville, at Morning View, Ky., a freight train was derailed by a misplaced switch and 7 cars were wrecked. A man in charge of horses was killed.

9th, on Central of New Jersey, at the drawbridge over Newark Bay, a freight train ran upon the bridge before the draw was closed, and the engine and one car ran upon the sleepers. There was a dense fog at the time. And 2 others on 2 roads, involving 2 freight trains.

UNFORESEEN OBSTRUCTIONS.

2d, on Burlington & Missouri River, near Clearmont, Wyo., a work train was derailed by running over a steel and 8 cars were wrecked. A brakeman was injured.

11th, on Lehigh Valley, at Levanna, N. Y., a freight train was derailed by a rock which had fallen upon the track, and the engine fell into the lake. The engineman was fatally scalded.

17th, on Wheeling & Lake Erie, at Mingo Junction, O., a freight train was damaged by running into an iron-mill locomotive crossing the main track. One employee was injured.

19th, 4 a. m., on New York Central & Hudson River, near Rome, N. Y., an eastbound mail and passenger train was derailed at a point where a rail had been maliciously loosened and the engine fell into a wide ditch and was submerged in water and mud. Four mail cars were wrecked and two sleeping cars were partially overturned. The engineer and a tramp were killed and 11 trainmen and mail clerks were injured. Four boys about 18 years old were arrested for loosening the rail and confessed the deed.

24th, on Kansas City, Memphis & Birmingham, at Winfield, Ala., a freight train was derailed at a switch which had been maliciously wedged open, and the engine and 4 cars were overturned. The engineman was killed.

28th, on Huntingdon & Broad Top, at Mt. Dallas, Pa., a freight train was derailed by a misplaced switch. It is said that the switch had been maliciously turned and that 5 other switches were misplaced the same night. A man who had been a passenger conductor on the road and was discharged several months ago has been arrested, charged with the crime.

29th, on Great Northern, near Troy, Mont., a passenger train ran into some rocks which had fallen upon the track, and the engine and several cars were badly damaged. The engineman and fireman were scalded.

30th, on Gulf, Beaumont & Kansas City, near Silsbee, Texas, a freight train was derailed by running over some hogs and the conductor was killed.

And 4 others on 4 roads, involving 1 passenger train and 3 freight trains.

UNEXPLAINED.

2d, on Pittsburgh & Western, at Evans City, Pa., freight train derailed, engineman and fireman injured.

10th, on Chicago, Milwaukee & St. Paul, at Sexton, Ia., a freight train was derailed and 2 trainmen injured.

12th, on Fitchburg road, near Melrose, N. Y., an engine was derailed and the fireman was injured.

14th, on Philadelphia & Erie, at Howard's, Pa., a freight train was derailed and 5 cars were derailed. One employee was killed.

15th, on Chicago & North Western, near Ames, Ia., a passenger train was derailed and two passenger cars were overturned; conductor and one passenger injured.

20th, on New York, Lake Erie & Western, near Sharon, Pa., a freight train was derailed and a brakeman fatally injured.

23d, 9 a. m., on Manhattan Elevated, at Fifty-third street and Sixth avenue, New York City, the engine of a passenger train was derailed on a very sharp curve.

25th, on Fremont, Elkhorn & Missouri Valley, near Andrews, Neb., a freight car in a mixed train jumped the track on a descending grade and the four following cars, including a passenger car, were derailed and partially overturned. The passengers were thrown together in a heap in the forward end of the car.

28th, on Norfolk & Western, near Canterbury, W. Va., a freight train was derailed and the engine fell down a bank; engineer, fireman and one brakeman fatally injured.

And 10 others on 9 roads, involving 3 passenger and 7 freight and other trains.

OTHER ACCIDENTS.

10th, 1 a. m., on Lehigh & Hudson, near Warwick, N. Y., the locomotive of a freight train which had just passed over a summit was wrecked by the explosion of its boiler. The boiler was thrown completely off the frames, and the train continued running for a mile and a half. The conductor, engineman, fireman and one brakeman were killed or fatally injured. The boiler was found to have been over-heated. The firebox was of the Wooten pattern, and the crown sheet was blue in the center for the whole length and for about 3 ft. in width. The engineman in starting on this trip had left the conductor behind, and this blunder had just been discovered. It seems likely that his agitation of mind concerning this matter may have led to neglect of the injector.

11th, on New York Central & Hudson River, at 109th street, New York City, a cylinder head of the engine of a passenger train was blown out and fell to the street below the track, injuring a pedestrian.

22d, on Central of New Jersey, at High Bridge, N. J., the locomotive of a freight train was badly damaged by

the breaking of a connecting rod, the boiler being ruptured. The engineman was fatally scalded.

27th, on Central of New Jersey, at Penobscot, Pa., the locomotive of a freight train was wrecked by the explosion of its boiler; engineman and fireman injured.

A summary will be found in another column.

Steam Heating of Passenger Trains.

CENTRAL RAILWAY CLUB.

The meeting of the Central Railway Club at Buffalo, Nov. 8, was reported in the *Railroad Gazette* of Nov. 15. The full report of the proceedings, just at hand, gives some additional points of interest. Mr. Mackenzie (N. Y. C. & St. L.) this year for the first time heard complaints that the use of steam for heating the cars demanded the use of additional coal in the locomotive, but on investigation he found that the trouble was due to the unnecessarily large exhaust nozzle on the locomotive. When this was reduced the complaints ceased. On his road steam is always blown through every car before it is coupled to the next car. Mr. Waitt (L. S. & M. S.) said that with the outside temperature at zero he had to use about 5 lbs. pressure per car.

Mr. Nelson (P. R. R.) said the return system on the Pennsylvania Road continued to give entire satisfaction. No radical changes have been made in the apparatus since it was introduced. There had been some trouble from freezing in the last half of the rear car, owing to there being no circulation in the pipes of that portion of the car, but by making a small opening in the globe valve, so as to feed steam into these pipes and keep them warm, the trouble was done away with. The pressure for heating is from 1 lb. to 2 lbs. per car, so that even with 11 cars in severe weather the pressure would not be over 22 to 25 lbs.

Mr. Martip, explaining the discrepancy between the statements of pressure on different roads, called attention to the fact that this was governed largely by the size of the main pipes. The Pennsylvania has no pipes or couplings less than 1½ in. in diameter. Other roads use couplings with openings as small as ¾ in. and the friction of the steam in small pipes necessitates a high pressure to overcome it.

Mr. Mackenzie has a pipe by which steam can be sent to the train without putting it through the reducing valve; by this means he can warm a train quickly with high pressure steam before starting out and then turn the steam through the regulator for the trip.

Safe Ending of Boiler Flues.*

The committee would like to have the time extended to make this report, from the fact of not having received the reports that would justify it in making a proper report, and in order that tests can be made upon this matter.

From correspondence received by your committee we find that Mr. R. B. Reading of the Manhattan Railway Company, New York City, has been butt-welding safe-ends to tubes for about eighteen months. When he first started butt-welding the safe-ends to tubes, he was rather sceptical as to the merits of the butt-weld for a tube. He welded a number of pieces of tubes in both ways, then made the test of pulling them until they broke, noting the pressure it took to break them. He found that the scarf-welded tubes invariably pulled apart where they were supposed to be welded and at a maximum pressure of 22,000 lbs., not one of the scarf-welded tubes were actually welded, although every care was used to make a good job of them, the man who welded them being a man of experience in this line of work. The scarfs invariably pulled apart and showed that they were simply stuck together and not thoroughly welded. The first tubes welded by the butt-weld were treated to the same pulling test and broke through the weld at about 22,000 lbs., showing a clean but hard-brittle fracture. In order to do away with this hardening of the metal at the weld, the following method of making the butt-weld was followed: A long, close-fitting mandril was swung from a post back of the forge, so that the end of it would swing around so as to be just above the fire. A collar was keyed on this mandril at the right distance from the end. The safe-end and tube were placed in the fire and brought to a welding heat, at the same time the mandril was turned so that it would be directly over the fire. In this way, while the safe-end and tube were being brought to a welding heat, the mandril would be heated to a fair red heat. At the proper time the safe-end was slipped on the mandril and against the collar, the tube was then put on the mandril and the end struck several light blows with a light hammer. The weld was then allowed to cool slowly and then tested, when it was found that the hardening of the metal at the weld had been done away with and a weld made that would not break until 35,000 to 40,000 lbs. pressure had been applied. The tubes were 1½ in. in diameter, and it took a pressure of 32,000 lbs. to pull a new piece in half.

In making the butt-weld, great care was taken to have the welding heat uniform, and the mandril on which to weld them not enough to prevent the weld from becoming chilled and hardened. It was also found that the weld could be spoiled by striking too many blows with too heavy a hammer; four or five blows with a 5 lb. hammer being sufficient to make a good weld, and if care be taken in matching the end no dressing up is necessary. The committee was continued to another meeting.

The Shenango Car Ferry.

Shenango No. 2, built for the car-ferry service of the Pittsburgh, Shenango & Lake Erie, between Conneaut, O., and Dover, Ont., has been put in commission. The car ferry line is operated under the name of the United States & Ontario Steam Navigation Co.

The transfer steamer Shenango No. 1 has been making the trip between Conneaut harbor and Port Dover in 11 hours.

Since it began regular trips last August, the ferry-boat has carried 1,364 cars of coal, 78 cars of iron ore and manufactured iron, 2 cars of stone, 3 cars of pumpkins, 2 of walnut logs, and 1 each of lumber and coke. This is up to Nov. 20. The coal weighed 70,408,000 lbs., of which over 51,000,000 was for the Grand Trunk Railway. The amount of duties collected in October alone was \$6,673.22. In the above no account is made of freight brought back to Conneaut or of passenger traffic.

* Report of a committee of the Central Railway Club.



ESTABLISHED IN APRIL, 1856.
Published Every Friday
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The successful reorganization plans of the past year have been severe; that is, the reorganizers have endeavored to ascertain what the actual financial situation of the property was, and to express that situation in terms of bonds and stocks. If one may judge from this feature, the plan issued for the adjustment of the affairs of the Philadelphia & Reading will be successful too, for besides raising \$20,000,000 through assessments upon the first, second and third income bonds and the common stock, it is proposed to reduce the annual fixed charges by \$700,000. The strenuous opposition is still active, and it remains to be seen whether it will be dissipated by this plan; but by far the greater part of the present general mortgage bonds has been deposited with the committee, who have avowedly tried to protect that prior mortgage by putting upon the junior securities the burden of sacrifice. The committee, having secured the co-operation of Mr. Morgan, have appointed J. P. Morgan & Co. their agents to carry out the proposals. A new general or blanket mortgage is to be created for \$114,000,000, of which \$44,000,000 is reserved for prior divisional bonds, and \$20,000,000 for new capital as required. The existing income bonds, after paying \$20 per bond, are to be converted into preference shares, first and second, in such proportions that the present holders will realize about the present market quotations. In this way the interest on the new general bonds will be just within the net earnings of this year. Thus the prospect for dividends on the new preference shares will depend upon the profits of the coal producers. As the Reading mines about 8,000,000 tons of anthracite a year, a comparatively small advance in price—since three-fourths of such advance would go to swell the net earnings of the combined railroad and mining properties—would go far toward a dividend on the new shares, of which there are to be \$28,000,000 first preferred and \$42,000,000 second preferred, each bearing four per cent. dividends when earned. How far such an advance is possible or probable is a matter of conjecture. The plan bears evidence that actual foreclosure is contemplated, at least upon the railroad. The old fear that such action, while it would relieve the property from unprofitable leases, would lose an old and valuable charter, is met by a hint in the plan that a controlling company for both railroad and mining interests, may be formed in New Jersey or some other state. To further protect the general mortgage a voting trusteeship is to be established whereby Mr. Morgan, Mr. Olcott and a third person are to control the shares for five years and until dividends are declared or until the trust shall be voluntarily surrendered.

A freight car costing \$500 ought to earn, when away from home, a minimum of something like \$86 a year (25 cents a day), and Mr. Edmund Yardley has made an interesting calculation explaining what items go to make up this amount. Mr. Yardley's paper is printed in another column, and, we think, deserves the attention of railroad officers who advoc-

cate a rate of only 15 cents a day for cars hired by one railroad from another. In the confusion of ideas that now prevails, the least that we can do is to try to keep our principles clearly defined, and it would seem that one of the first principles should be that cars be not lent for less than cost. A rate below cost is a constant temptation to every road, at all times when its own supply is inadequate, to keep borrowed cars longer than it has a right to. The same as most roads do now, under the present less-than-value rate. A per diem rate above cost would intensify another evil from which we now suffer, the building of cars by non-carriers to be lent to the railroads; for whereas the private owners now have to see that their cars make long trips with freight that is quickly unloaded, they would, with a per diem rate, find equally fat dividends with all kinds of freight. To fix the interchange rate as near cost as is practicable, without introducing too great variety of rates for cars of different size or value would seem to be at least a rational line to begin upon, even if it be not the ideal of perfection for a permanent arrangement. Lending at cost would not meet the views of those who wish to make the per diem rate large enough to act as a penalty, but why not leave the penalty question to be dealt with later, as must be done with the problem of loaded grain cars detained a month at the seaboard and empties held two months in the West? The movement to adopt the per diem principle is stuck fast because large borrowers object to a change which will make their cars cost them more than at present; but it is well to remember that this aversion to change is not wholly due to the favorable situation these roads find themselves in as regards cars detained a long time; they also enjoy an unfair advantage on cars which are not unreasonably detained. If per diem is not to be adopted the mileage rate ought to be increased to a figure nearer the actual average daily cost of a car. At six mills a mile, the present prevailing rate, the average car earns less than 15 cents a day. The reduction to six mills has, indeed, produced a slight shrinkage in the amounts paid to some of the private car companies, but it is only slight, and the great abuse remains practically undisturbed. To lend your own cars to short terminal roads at 40 per cent. less than cost, so as to be able to enforce upon the private car companies a reduction of 20 per cent., which still leaves the burden of their contracts very heavy upon the railroad company, is a very inadequate remedy for the unequal conditions now existing. The only rational way, under the mileage system, to deal with refrigerators and stock cars which make great mileage is to refuse to hire them except at a large discount from the average rate.

It has been said that those who advocate per diem exploit their theory a good deal, to the neglect of practical points and practical difficulties. They are continually harping on arguments which would be sound if all railroads were willing to adopt a plan whose average results are not unjust. But an average is worse than meaningless in this connection. The average rate of freight on two railroads may be a cent per ton per mile; but if one road receives 5 mills and the other 15 there is not much comfort to the former in the fact that the average is all right. This is too simple to need explanation, and yet the advocates of per diem go on with their arguments as though this difficulty would right itself. If the law of averages could be shown to afford any benefit to individual roads in this matter, Per diem would at once add a score of important roads to its circle of friends. But as long as the A & B loses \$10,000 a year and the C & D gains that amount by the change the A & B will be firmly opposed to per diem and the C & D will be enthusiastically in favor of it. But if the theorists can be accused of being wedded to their theory we think that the Committee of the American Railway Association is equally open to the charge of keeping its eyes fixed too closely upon the so-called practical aspect of the problem. The report presented last April showed that the average receipt per day for each car sent to a foreign road was about 15 cents, and as every road is supposed to be unalterably opposed to any change which will either increase or decrease its receipts or payments the committee recommended that the per diem rate be fixed at 15 cents. This had the air of being intensely practical and conservative; theory was thrown aside and actual "business" was the basis of the recommendation. But every one knows that even if the average movement or service of a car were to remain absolutely unchanged the change from mileage to per diem would produce most radical increases or decreases in the monthly payments of half the roads in the country. Some roads are doing everything in their power to have per diem adopted, and why? Because they would certainly pay less for borrowed cars. It follows that some other

roads would surely pay more, if the average results remained the same. If detention at stations could be entirely abolished, it might be argued that the short terminal roads would be on an equality with the long intermediate lines; but even assuming that impossible ideal condition, and that cars would make 50 miles or 200 miles a day, instead of 25, there would at once be a great surplus of idle cars to complicate matters until business increased or the cars rotted down. The statement of the A. R. A. committee about the aggregate increase of payments that would be necessary if car owners demanded 25 cents a day instead of 15, has no significance as an argument. The question with each road is, shall we pay any more than now? And if we do, shall we get the money back, or secure any corresponding benefit? Arguments which are intended to convert to the per diem principle a road which is now enjoying an unfair advantage should deal, not with seventeen-million-dollar aggregates, but with the direct question of right and wrong, and business fairness. The committee might do well to preach a little, even at the risk of being looked upon by some as impractical. Per diem is needed because under simple mileage the short terminal roads (and long terminal roads, too) get their cars too cheap, and all roads have a chance to keep borrowed cars without rendering fair payment for them (to say nothing of the opportunity for cheating by running such cars without paying mileage). And of all the unbusiness-like reasons for continuing the present plan the most absurd is the claim that because a road always has had an unfair advantage it always ought to have it.

The Interstate Commerce Commission on the Oil Rate Cases.

Another indication that the Interstate Commerce Commission has waked up into new activity is a recent decision which is remarkable, not only for the large damages it awards and the number of years it covers, but also for the intrinsic difficulty of the problem which it attacks. The mere fact of the judgment in this case was given out by the Commission at the end of October, and was referred to in the *Railroad Gazette* of Nov. 1, but the full text of the opinion was not distributed until last week. In itself, the bare award was startling, as it gave an aggregate of about \$85,000 damages, with interest for a year and a half at six per cent. But the full discussion of the case is interesting for other reasons, for it may be taken as a typical example of the difficulty experienced by a railroad commission in dealing practically with what seems a simple problem, and, beyond this, it affords a beautiful illustration of the slowness with which such a proceeding drags along to its end.

This tedious progress is not entirely the fault of the Commission; it is partly a necessary feature of the situation whenever the law is obliged to step into the fields of railroad operation. In the present case the delay seems exaggerated, for the whole matter began as far back as 1888. The several complaints were all in by January, 1889, and answers were filed promptly by the defendant railroads, which were the Erie, the Western New York & Pennsylvania, the Lehigh Valley, and the Pennsylvania. Counsel for the roads took till the last quarter of 1891 to work up their case, the Commission labored with the question for another year, and at the end of 1891 published its ultimatum. This decision of Nov. 14, 1892, declared that the railroads had lost their case, and must pay damages to the complainants, but the effort of deciding the point in issue was so great, that it was left for further proceedings to settle the amount of these damages. A new lease of life was thus given to the case, but claims were slowly filed, and the railroads delayed as far as possible on their side, until, after lingering for three years, the Commission by a sudden effort called in all statements at the end of July, 1895, and finally has decided the amount to be awarded, which covers over seventy claims.

But the end is not yet reached. As the case stands, the claims against the Pennsylvania Railroad were not settled, no award was made, and the parties were left to take the matter direct to the Courts. The other roads also have the right of appeal to the court which always makes a new investigation, from the beginning, of the whole of any matter decided by the Commission, so that it looks as if the end of the story might not be reached until the next century. The mills of the gods certainly grind slowly. Yet even this does not show the whole difficulty in the way of ever attaining to any conclusion. The bulk of the damages are assessed against the Erie and the Western New York & Pennsylvania. Unfortunately, while this case has been dragging its slow length along through seven years, both of these corporations have gone out of existence, new companies stand in their place, and the problem of collecting these claims against their defunct predecessors is not so easy of solution.

This whole story offers a rather discouraging comment

on the practical effectiveness of the dealings of a railroad commission with a complicated situation. It is fortunately a somewhat exaggerated case. But when we turn to the substance of the original complaints, we find that the decision of the Commission was open to grave doubts.

Apparently the problem was simple. Certain independent refiners, shipping oil from Pennsylvania to markets in New York and New England, were obliged to send their product in barrels, because no tank cars were furnished by the railroads, and freight was charged on the barrels as well as their contents. They complained that their great rival, the Standard Oil Company, shipped its oil in tank cars, which it owned itself, and leased to the railroads. It seemed a clear case of discrimination, where facilities, and resulting cheaper rates, were furnished to one class of shippers and not to another, and the case looked particularly bad because the favored party was the wicked Standard Oil trust. As it usually happens this simple problem becomes more complicated on closer inspection. It was easy in theory for the Commission to say that equal facilities must be furnished to all shippers. What this meant, when applied to the actual operation of the roads, was that the railroads must either provide tank cars, or stop charging any freight on the weight of the barrels, 60 lbs. each. Now, for two of these roads which were in the direst straits of poverty, it was wholly impossible to comply with the first alternative, and it was almost equally difficult to follow the second, for rates as they stood were nearly unremunerative. It was clearly useless to try to apply this rate to such conditions, but, beyond this, there was justification for the different rates on the two methods of shipment. The quantity of freight in a tank car was shown to be greater than the oil and weight of barrels together in the other mode of carriage, so that some difference in charge was in accordance with proper economy in handling traffic.

Again, it is by no means certain that there was injustice on the part of the roads in failing to supply tank cars to the public. There is only a limited demand for such cars; the greater part even of the oil shipped by the Standard Oil Company is sent in barrels. Of the whole number of tank cars in the country, it was shown that the Standard Oil owned nearly three-fifths, the railroads about one-fifth and independent refiners the remaining fifth. Among the railroads the Pennsylvania was the only one which owned more than a few such cars, and it was shown to have met all the demands of the public by making half its cars free to any shipper. Under these circumstances it is hard to understand how the complainants could reasonably demand that cars be furnished to them, and persuade the Commission to rule in their favor. This decision of 1892 is, of course, a matter of history, but we have revived it to show that the case against the railroads was doubtful at the start, and should have been promptly passed upon by the court of last resort. Instead of this, the Commission is now trying to enforce it by a long accumulated series of penalties which have just as much to be reviewed by the courts, and which only prolong a tedious proceeding over an unnecessary length of time.

November Accidents.

Our record of train accidents in November, given in this number, includes 80 collisions, 62 derailments and 4 other accidents, a total of 146 accidents, in which 46 persons were killed and 169 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident, as reported, make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	But-ting.	Cross-ing and other.	Total.
Trains breaking in two.....	15	0	0	15
Misplaced switch.....	2	1	2	5
Failure to give or observe signal.....	7	2	7	16
Mistake in giving or understanding orders.....	0	4	0	4
Miscellaneous.....	5	1	5	11
Unexplained.....	11	7	11	29
Total.....	40	15	25	80

DERAILMENTS.

Broken rail.....	2	Animals on track.....	2
Loose or spread rail.....	3	Landslide.....	4
Defective switch.....	2	Washout.....	1
Broken wheel.....	4	Maliciously misplaced switch.....	1
Broken axle.....	7	Malicious obstruction.....	2
Broken truck.....	1	Unexplained.....	19
Broken drawbar.....	2		
Broken car.....	1		
Loose wheel.....	2		
Misplaced switch.....	5		
Open draw.....	2		
Total.....	62		

OTHER ACCIDENTS.

Boiler explosion.....	2
Cylinder explosion.....	1
Broken side rod.....	1
Total.....	4

Total number of accidents..... 146

A general classification shows:

	Colli-sions.	Derail-ments.	Other acci-d's.	Total.	P. c.
Defects of road.....	0	7	0	7	4
Defects of equipment.....	15	17	4	36	25
Negligence in operating.....	36	7	0	43	29
Unforeseen obstructions.....	0	12	0	12	9
Unexplained.....	29	19	0	48	33
Total.....	80	62	4	146	100

The number of trains involved is as follows:

	Colli-sions.	Derail-ments.	Other acci-d's.	Total.
Passenger.....	30	18	1	49
Freight and other.....	111	45	3	159
Total.....	141	63	4	208

The casualties may be divided as follows:

	Colli-sions.	Derail-ments.	Other acci-d's.	Total.
Killed.				
Employees.....	23	10	5	38
Passengers.....	1	2	0	3
Others.....	2	2	0	4
Total.....	26	15	5	46
Injured.				
Employees.....	56	29	2	87
Passengers.....	29	49	0	78
Others.....	2	1	1	4
Total.....	87	79	3	169

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. Killed.	Pass. Injured.	Emp. Killed.	Emp. Injured.
Defects of road.....	0	23	1	2
Defects of equipment.....	2	25	5	4
Negligence in operating.....	2	29	23	60
Unforeseen obstructions and maliciousness.....	0	0	4	15
Unexplained.....	0	1	5	6
Total.....	4	78	38	87

Twenty-nine accidents caused the death of one or more persons each, and 42 caused injury but not death, leaving 75 (51 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with November of the previous five years shows:

	1895.	1894.	1893.	1892.	1891.	1890.
Collisions.....	80	59	92	106	112	111
Derailments.....	62	84	101	84	119	90
Other accidents.....	4	3	7	9	4	3
Total accidents.....	146	146	200	199	235	204
Employees killed.....	38	17	43	44	46	44
Others killed.....	8	5	28	17	23	22
Employees injured.....	87	47	108	103	134	125
Others injured.....	82	19	87	96	73	140
Passenger trains involved.....	49	44	66	75	71	76

Average per day:

	1895.	1894.	1893.	1892.	1891.	1890.
Accidents.....	4.87	4.87	6.67	6.63	7.53	6.80
Killed.....	1.53	0.73	2.37	2.03	2.39	2.22
Injured.....	5.63	2.29	6.50	6.63	6.90	8.83

Average per accident:

	1895.	1894.	1893.	1892.	1891.	1890.
Killed.....	0.32	0.15	0.35	0.36	0.30	0.32
Injured.....	1.16	1.45	0.97	1.00	0.91	1.29

Of the four fatal injuries to passengers in November two were in a derailment at Elm Grove, W. Va., on the 3d, where a passenger train was wrecked by a broken wheel, about 100 passengers being shaken up. We have no information as to the kind of wheel or the nature of the fracture of the flange. The passenger who was killed on a train of the New York & Brooklyn Bridge Railroad was standing on the car platform. This collision seems to have been due to careless running during a dense fog. The trains approach the Brooklyn terminus on a descending grade, running by gravity, and the speed is managed entirely by the brakes. The trains run only about one minute apart, and necessarily at moderate speed; but, as this case shows, accurate judgment on the part of the person who controls the speed is even more necessary than on trains which run faster, but which have longer or more definite time intervals or space intervals to guide the man in charge.

There were four other startling accidents to passenger trains, though no passenger was killed in them. At South River, N. J., on the 6th, the engine of a passenger train went into an open draw; at Corona, Ala., on the 17th, a passenger train was run into by some runaway freight cars traveling at 80 miles an hour; at Rome, N. Y., on the 19th, a fast and heavy train of the New York Central was wrecked by malicious boys, as heretofore reported in the *Railroad Gazette*; at Shoemaker, N. M., on the 25th, one of the elegant new passenger trains of the Atchison, Topeka & Santa Fe had a violent collision with a freight train.

The very distressing case of a boiler explosion near Warwick, N. Y., on the 10th, is described in the record. The collision at Edgeworth, Mass., on the 3d, was investigated by the Massachusetts Railroad Commissioners, and from their report it appears that on an important main line, within a few miles of a great terminal, a freight conductor used the main track after lark with as little regard for the rights of passenger trains as though he had been on a Western prairie in broad daylight where passenger trains run 20 miles an hour.

The terrible street car disaster in Cleveland on the 16th was reported in the *Railroad Gazette* of November 22. The other electric car accidents in November were not unusually disastrous. At Dayton, O., on the 3d, a wagon containing 16 persons was stopped on an electric track, in consequence of one of the horses receiving a shock; this caused some delay, and a street car ran into the wagon, injuring 15 persons. A runaway cable-car in Brooklyn, N. Y., on the 12th, caused considerable damage and injured one passenger. In Jersey City, on the 13th, a heavy iron tank car used for sprinkling the streets ran away, and the two men upon it were injured. In Tacoma, on the 20th, a freight train on an electric line was derailed on a high trestle, and the lading of the cars, mostly lumber, fell to the gulch below, though the cars were kept on by the guard timber. Near Toledo,

on the 24th, an electric street car was overturned and three passengers were injured. At Wilkes-Barre, Pa., on the 29th, there was a butting collision of electric cars in a fog, injuring a number of persons and wrecking the ends of both cars.

On the 1st, at Lancaster, Pa., an electric car ran into a passenger train; at Aurora, Ill., on the 12th, there was a similar accident, and the motorman was killed. On the 16th, at Cumberland, Md., a street car was struck by a freight train, but the passengers had notice, and succeeded in getting out before the collision.

The opinion recently issued by the Interstate Commerce Commission, and noted in the *Railroad Gazette* last week, on the complaint of Sioux Falls, S. D., that the rates from Chicago and Duluth to that city were too high in proportion to the rates from the same starting points to Sioux City, holds that the difference between the two cities should be reduced one-half; that is to say, the rates from Chicago to Sioux Falls, which are now 108 per cent. of the rates to Sioux City should be reduced to 104 per cent. The question of rates from Duluth seems to have lost its importance. When the complaint was made, freight from the Eastern states was carried by way of Duluth at rates low enough to compete with the tariffs by way of Chicago, but the tariffs by way of Duluth have now been practically all withdrawn, and the Commission therefore does not undertake to disentangle the snarl which the long and short haul clause of the law makes when applied to the low rates by the roundabout Lake Superior line. On shipments coming via Duluth the short haul was to Sioux Falls and the long haul to Sioux City. On those coming through Chicago the conditions were reversed. The Great Northern, bringing freight from Duluth, wished to charge a higher rate to the nearer point, but the decision refuses to sanction any such tariff. Commissioner Knapp, who wrote the opinion, found the conditions very perplexing, and after discussing the subject to the extent of 25 pages arrives at a decision whose soundness rests on the very firm foundation of "Dutch justice." Rates from Chicago to Sioux City were, several years ago, placed on an equality with those to other Missouri River points; this was an unwarrantable reduction, but it is now too late to talk about making an advance, and, as the complaint of Sioux Falls, regarding the disadvantage under which it labors, deserves consideration, the only way to give the city a show of justice is to "split the difference." A press dispatch from Sioux Falls says that the wholesale merchants of that city are jubilant; but it remains to be seen how far the railroads will respect the decision.

Although the business of building new railroads has this year fallen to a very low state in this country, that class of railroad men who find congenial amusement in violence and law-breaking seem to be even more active than ever. At Wellston, O., last Monday it was reported that a "war" between the Cincinnati, Hamilton & Dayton, the Ohio Southern and the Baltimore & Ohio on one side and the Columbus, Hocking Valley & Toledo on the other, over a track connection, had involved 500 railroad employees, and was participated in by a coal mining company, the size of whose effective fighting force is not stated. For heavy artillery it appears that 15 locomotives were used, and the principal damage done to "the enemy"—which side he was on is not stated—was the destruction of 25 coal cars. "A whole train came near being pushed into a coal mine." At this point the reporter had to pause to catch his breath, and we are left in doubt as to whether this train tumbled down a shaft 1,000 ft. deep or was simply propelled in orderly fashion along a horizontal track leading into the coal mine. At Baltimore, Md., last week there was a railroad battle, the circumstances of which must strongly incline the sympathizing reader to side with the under dog in the fight. The Baltimore, Middle River & Sparrow's Point Railroad, which seems to be an electric line, started to lay a track beneath a trestle of the Baltimore & Ohio near Eleventh street; but the bigger road, being literally "on top," poured gravel down upon the tracklayers in such copious showers that they had to desist. Previous to this the warfare had been carried on by such more familiar instrumentalities as fists, picks and brick bats. A foreman and two laborers were wounded. Later an injunction was secured commanding the Baltimore & Ohio not only to stop sifting gravel through the trestle, but to take away that which it had already deposited.

Representative Broderick, of Kansas, has introduced in Congress a bill making it a felony to shoot at or into any locomotive, caboose, coach or car of any train, or to throw any rock or other missile at a train, or to derail or forcibly obstruct a train at any place within the exclusive jurisdiction of the United States or in the Indian reservations. Senator Call, of Florida, stands a good chance of taking the medal—and it ought to be a large one—for introducing in Congress useless bills to waste the time of the public printer. We noted last week two bills of his which can be of no possible benefit except to the paper-mill which the Government patronizes, and now he has introduced another which for comprehensiveness and general power to reform the world "lays over" the other two put together. It provides that passenger fares on all railroads engaged in interstate commerce shall not exceed one cent a mile. It is made lawful to have separate cars for different races, nationalities, and kinds of people. Sleeping-car charges

are reduced to \$1 for each 24 hours of occupancy; freight charges are ordered to be reduced to an amount not exceeding that necessary to pay the interest (not exceeding 5 per cent.) on the present value of the railroads, estimated upon the basis of the cost at which such railroads could be duplicated. A fine of \$10,000 for each violation is provided, half of which is to be paid the informer; or the penalty may be imprisonment for not more than one year. On further reflection we are disposed to modify what we said about impracticability. That \$5,000 for the informer is decidedly business-like. Those congressmen who remain in Washington after their terms expire, looking for clerkships, might be of more benefit to the world if they would undertake to detect railroad law breaking—there is enough of it—at \$5,000 for each detection.

The organization of the Joint Traffic Association, as far as it has been announced, is given in another column of this issue. The trunk lines have already taken action looking to the carrying out of the conditions of the new agreement. The Executive Committee has voted to abrogate all through rates from Europe after Jan. 1, and that full domestic tariff rates be charged. Each road is to file with the Association the names of its import agents, and the commissions paid to such agents must not exceed 15 per cent. on classes 1, 2 and 3, or 10 per cent. on classes 4, 5 and 6. New York importers complain that their Western business is bad enough already, and that this advance will destroy it entirely. It appears, however, from well-known facts and from the admissions of the merchants themselves, that the disadvantage which New York labors under is largely a question of facilities. Through rates from European ports to Western cities by way of Boston, Norfolk, New Orleans and other ports are at least as cheap as by way of New York; and under long-standing differentials, the rail rates from the Atlantic port westward are lower from ports south of New York than from New York and Boston; and, in addition to this, the track connections with wharves, especially at Boston, give these other ports an advantage of 60 or 70 cents a ton, which must be paid for lighterage at New York.

NEW PUBLICATIONS.

Giving and Getting Credit. A Book for Business Men. By Frederick B. Goddard. New York: The Baker & Taylor Co., 1895; 218 pages, 12 mo. Price \$1.

Mr. Goddard has written a book "for business men" that is worth reading; it is, moreover, easy and racy reading, formulating what one already knows in a logical way, and surely, to any one business man, furnishing much that is new to him. The chapters are Credit and Money, Failures and Changes in Business Conditions, Suggestions and Precautions, Estimates of Credit, Points on Giving Credit, Collections, Corporations, Mercantile Agency Systems, Credit Guarantee or Indemnity Systems, A Uniform Bankrupt Law, Panics, and the Panic of 1893. An appendix gives synopses of the assignment, insolvent and exemption laws of all the states and territories.

Mr. Goddard's position has enabled him to draw his conclusions from numerous examples, and he has not been driven to project a philosophy from within himself or from his understanding of other men's philosophies. He has worked from actual observation, and is able to illustrate his points by citations of experiences.

He apparently thinks that honesty, alone, is not worth so much as formerly for credit purposes, and cites that "lack of capital and capacity" account for three-fourths of the liabilities unpaid. The majority of men mean to be honest. The chapter "Points on Giving Credit" is full of wisdom, and it is evident that the author's broad experience and capacity for character study would have enabled him to give twice as much on this vital subject. It is a pity he did not do so. The best preventive of "panics" is a knowledge of the conditions that usually precede them. History repeats itself surely in commercial affairs, and the best reading for a corporation officer or investor is the record of the money disturbances of the present century. This is given concisely and apparently correctly from the panic of 1814 to the currency difficulties which culminated in 1893. "It were better that we call half a bushel a bushel, and half a yard a yard, than half a dollar's worth of silver a dollar."

Plain Lettering. A text book by Henry S. Jacoby, Associate Professor of Civil Engineering in Cornell University. New York: The Engineering News Publishing Co., 1895; 82 pages and 48 plates. Price \$3.

Everyone who has ever attempted to letter a map or a drawing has, no doubt, felt the want of just such a book as this of Professor Jacoby's, and when we look through the unusually complete set of plates which he has appended to his work we see that a draftsman or an engineer may be able to make use of such a book in almost every branch of his work. Professor Jacoby has produced an exceedingly valuable and useful handbook. It deals in an eminently practical way with the spacing of letters in titles and their relations to each other, their arrangement in the forms of headings or captions and their individual forms. The analysis of the relative proportions of letters, the general details of their construction, the theory of spacing and the rules and tables for the same, the chapters on "Titles," on "Mechanical Aids," etc., all show a very careful study of the subject, and we feel sure that this book will not only find a place as a textbook in all technical schools, but will also prove a most welcome addition to the outfit of every drafting room.

The variety of the styles which Mr. Jacoby shows in the plates at the end of this book is remarkable. One would hardly suppose that so many easily formed letters could be made which would differ from each other so strikingly in appearance and style. Some of the plates show reproductions of contour or topographical maps, the different styles of lettering which are used indicating to the student the types best adapted to certain purposes. Others represent captions or titles taken from charts and maps or from drawings such as the engineer would make in designing a bridge or a steam engine. Still others are architectural plans, showing the best forms of lettering for different parts of the drawing. The reduction of the rules for spacing and proportion to time-saving diagrams is a most commendable feature.

On Jan. 1 "The American Engineer and Railroad Journal" and the "National Car and Locomotive Builder" will be consolidated into one publication, with the title *American Engineer, Car Builder and Railroad Journal*. The form of the paper will then be changed and it will be issued monthly. Mr. M. N. Forney will have charge of the editorial department, assisted by Mr. Waldo H. Marshall, heretofore editor of the "Master Mechanic" of Chicago. This arrangement will, we have no doubt, be good for the readers of both papers, and we wish the proprietors a merry Christmas—provided they will cut out four or five words from the title of the paper.

TRADE CATALOGUES.

Tobin Bronze. The Ansonia Brass & Copper Co., 19 and 21 Cliff street, New York.

Everyone knows of that useful metal Tobin bronze which, besides being adapted for piston rods and shafting for pumps, yacht shafting, commutator segments, bolts, nuts, etc., has attained such fame as a material for the hulls of racing yachts. Its tensile strength is given in the catalogue as about 79,000 lbs., with an elastic limit of about 53,000 lbs., tests being made on rolled plates $\frac{1}{4}$ -in. thick. In $\frac{1}{2}$ -in. rods the results were about the same. In wire about 0.2 in. thick 103,896 lbs. ultimate was obtained. The bronze at cherry red heat may be forged and stamped very readily, and can also be drop forged. Its specific gravity is about 8.38. Some of the tests given in the catalogue are very interesting, covering a series of tensile tests made upon a Fairbanks testing machine and also some torsional tests made at the Stevens Institute by Prof. J. E. Denton; also some transverse tests, some corrosive and some crushing tests.

Metallic Packing. The United States Packing Co., 427 North Thirteenth street, Philadelphia, Pa.

This well arranged catalogue, which we are pleased to note, conforms to the M. C. B. standard in size, contains a price list of the various forms of packings made by the above company for stationary engines, locomotives, air pumps, etc. In addition, the catalogue contains engravings and some descriptive matter concerning McDonald's balance valve, the Gollmar bell ringer, with automatic starter; Norris' lever lock mechanism, which may be applied to the throttle as well as the reverse lever, the McIntosh improved automatic oil cellar and sight feed oil cup; Saylor's portable drilling, reaming and tapping machine, oil cups, oil cups and other similar devices.

Switch Indicators.

BY W. W. SALMON.

In general the function of the switch indicator, used in automatic electric block signaling, may be defined as "the giving of an indication at a switch as to whether this switch may be thrown to permit the movement of a train from a siding to a main track or from one main track to another."

The first road to start upon the installation of such indicators upon any considerable scale was the Illinois Central, which used them on its Chicago terminal in 1892-1893.

The indicator used is audible, consisting of an electromagnetic vibrating bell enclosed in a box placed on a post at the switch stand. The bell differs from those used for ordinary annunciators, being better constructed. The parts that usually fail in such devices have been strengthened or made in duplicate, as, for example, the circuit closing parts of the device. Vibratory electrical devices are subject to considerable sparking, and consequent corroding of the contact parts, introducing so much resistance that a bell may ring only very feebly or not at all. Therefore, we use a series of four flexible contacts, provided with a broad plate of corrugated platinum instead of the ordinary platinum point. The contact thus made is a sliding and self cleaning one; the discharge upon break of contact is distributed over a much larger area and occurs at a point distant from the one where contact is finally made.

The circuit employed is such that when the first wheels of a train enter a block the bells at all the switches in the section of track between the signal governing this block and the next block signal begin to ring. The bell at each switch ceases to ring when the entire train shall have passed this switch. The signal battery, which is taken out of the signal circuit instantly when a train enters the block, is used to operate the bells. The only rule issued regarding the use of these bells was as follows: "Each switch is provided with a bell which will ring when a train is approaching it in the block, and switch must not be opened until train has passed."

The Kansas City, Fort Scott & Memphis at its Kansas City Terminal has similar indicators, but the bell starts to ring within 1,000 ft. of the block in which switches where the train comes are located. This provides against the opening of the switch at or near the same instant that a train is passing the block signal. This application went into service in January, 1893. The Kansas City rule reads:

"While any such bell rings, none of the switches governed by it should be used, except in emergencies, in which case, after waiting one minute the switch may be used, if a flagman is sent in the direction of the approaching train or engine a sufficient distance to afford perfect protection."

On the Chicago & Northwestern Mr. E. C. Carter (Principal Assistant Engineer) determined to use a visual indicator operated on a normally closed circuit, and so installed that in no case could the breakage of the indicator wires or failure of battery or other parts give a clear indication falsely. The indicator employed consists of a circular red disk attached to the rotary armature of an electro-magnet and placed in a water-tight cast-iron box, fixed on a post set opposite the switch. In the front of the box is a circular plate glass window, slightly larger than the indicator disk. The disk is so placed as to be visible through this window when the electro-magnet is demagnetized; and it is drawn up out of sight when the current is passing through the coils. When a train approaches within about 2,000 ft. of a block in which there are switches, the indicators at each siding switch in this block, and at the main line cross-over switches in the opposite track, are all set to danger. The indicator at each switch in turn is cleared as the train passes this switch, or, if a number of switches are closely grouped, all indicators in such group are cleared when train passes last switch. Here, besides the employment of the visual, instead of the audible, signal, the indicator is set to danger at the switch in the other main track in the case of cross-overs. This is to prevent trainmen setting the first cross-over switch and permitting the train to proceed toward the other main track before it is seen whether another train is approaching on the other track. These indicators were installed with wire circuit, and the following rule was issued: "A train allowing another train to pass it shall not come out on the main track until the train which has passed shall have reached the next signal, or had ample time to do so; but shall open the switch leading to the main track in order to keep the signal back of the switches at danger for its own protection."

The next style of application is the one in most general use, and is, I believe, used altogether with automatic electric block signals recently installed in the East. It differs from that on the C. & N. W. chiefly in the fact that it is cleared only when the entire train shall have passed out of the block. One of these latest applications was placed in service on the Burlington line between St. Louis and West Alton last month.

These indicators have no light at night. When a train has approached within one-half mile of a block signal, the indicators are set to danger and remain so until train has passed 2,000 ft. beyond the next signal; a train will also set to danger indicators at main line cross-over switches in the other main track, but will not affect the indicators at main line cross-over switches on the track on which the train is running. The rule provides that when a train is about to move from a siding to main line, trainmen must first observe position of indicator. . . . If the indicator shows danger switch must not be thrown until flagman has been sent out as required by rule No. 90. When a movement is to be made from one main track to the other trainmen must first observe the position of the indicator at cross-over switch in the track occupied by their train. If this indicator is "clear," this switch must be thrown first; then the other switch of cross-over may be thrown and train may proceed. If, however, this indicator is at "danger" neither switch must be thrown until flagman has been sent out as required by flagging rule No. 90. If an indicator does not show a red disk after a switch has been opened, it signifies that the block signal has failed to go to danger. In such case the rule requires movements to be made under the protection of a flag.

In this application it will be noted that the indicator acts as a block signal, giving, when clear, equal rights to a train to proceed at speed into any portion of the block precisely as though a train were entering under the clear block signal itself, the necessity for flagging in such case being disposed of.

The Michigan Central indicators are controlled and operated in practically the same manner as the Burlington, except that a circuit-closing device is used on the block signal, to prevent the indicators from going to danger upon the opening of a switch while the block signal actually occupies the danger position. The rule relative to this particular feature is as follows:

"No switch must be opened excepting under the protection of a flag, when the indicator at that switch shows a red disk, until it is ascertained that the block section protected by the semaphore connected with such indicator is not occupied and that no train is approaching such semaphore. If the indicator does not show a red disk after a switch has been opened it signifies that the semaphore has failed to go to danger. In such a case movements must be made under the protection of a flag."

Joint Traffic Association.

The Board of Control of the Joint Traffic Association met in New York City, Dec. 12, and organized by the choice of George B. Roberts, President of the Pennsylvania, as President, and F. H. Hoyt, now Secretary of the Joint Committee, as Secretary. The principal business was the selection of arbitrators, and the men selected are James F. Goddard, Garrett A. Hobart and Jacob D. Cox.

Mr. Goddard has been Commissioner of the Trunk Line Association and Chairman of the Joint Committee for the past five years. Previous to this he was Third Vice-President of the Atchison, Topeka & Santa Fe. Mr. Goddard's ability as a traffic officer is too well-known to need mention, and his impartiality as an arbitrator "goes without saying," as the mental qualifications and expert knowledge which go to make one successful in a place of this kind are just the qualities that he has been called upon to exercise in the commission which he has held during the past five years. His selection as the first member of the Board of Arbitrators shows the unanimity with which the presidents, who have dealt with him during his incumbency of the Trunk Line commission, believe in his ability and integrity.

Mr. Goddard was born at Brockton, Mass., in January, 1842, and entered railroad service in April, 1868, with the Chicago, Burlington & Quincy. He was on that road, in the general freight office, for 10 years and then went to the Atchison, Topeka & Santa Fe, where he remained until 1890, rising by successive promotions to the office

* A paper read at the Railway Signaling Club, Chicago, Dec. 10. Condensed.

of Third Vice-President. He was Chairman of the Western Passenger Association for a short time, and came to New York Nov. 1, 1890.

Mr. Hobart is a prominent lawyer of Paterson, N. J., and is Chairman of the State Republican Committee of New Jersey. He was born at Long Branch in 1844 and was admitted to the New Jersey bar in 1866. He was in the New Jersey Legislature many years, holding the office of President of the Senate for two years. He has been Receiver of the New Jersey Midland, of the Montclair Railroad, and of the First National Bank of Newark. He is a director in a large number of corporations, including the New York, Susquehanna & Western and the Lehigh & Hudson River Railroads and the American Cotton Oil Company.

Jacob D. Cox, LL. D., of Cincinnati, ex-Governor of Ohio, was born in Montreal in October, 1828, but his parents were citizens of the United States. He graduated at Oberlin College in 1851. He was a member of the Ohio State Senate from 1859 to 1861. He received a commission as Brigadier-General in May, 1861. He fought in numerous important engagements and was promoted to Major General. He was Governor of Ohio in 1866-7, and was Secretary of the Interior in President Grant's cabinet from March, 1869, to December, 1870. He was elected President of the Wabash Railroad in October, 1873, and was a member of Congress from Oct. 15, 1877, to March 3, 1879. He stands very high as a lawyer in Ohio.

The Board of Managers met last week and organized by the choice of H. J. Hayden, Second Vice-President of the New York Central, and representative of the Vanderbilt System in the Board, as Chairman, and Geo. R. Blanchard, now Commissioner of the Central Traffic Association, as Commissioner. No other Commissioner will be appointed at present. It is said that Mr. Goddard will continue to hold the office of Commissioner of the Trunk Line Association, for the present, and that Mr. Blanchard will also remain Commissioner of the Central Traffic Association. It has not yet been decided to abandon these two associations or even to modify their functions. It has been stated that Mr. Goddard will be the only member of the Board of Arbitration who will sit regularly in New York, the other two members coming only when called, but it does not appear that any official decision has been reached on this point. Under the agreement the arbitrators make their own rules.

Mr. Hayden's selection as Chairman of the Board of Managers was to be expected from the active part which he has taken in the preparation of the agreement. He was Chairman of the committee of nine who revised the original proposition so as to make it acceptable to all interests. Upon that committee really devolved a large amount of diplomatic work, for many of the members were by no means impressed with the value of the proposed association when the subject was first brought up.

Mr. Blanchard's elevation to the Commissionership naturally follows Mr. Goddard's promotion, the latter having been Chairman and Mr. Blanchard Vice-Chairman of the Joint Committee for many years. Mr. Blanchard was born at Rochester, N. Y., in 1841, and was in the freight department of various railroads in the West from 1858 to 1867. In 1872 he became General Freight Agent of the Erie, and was soon afterward made Vice-President, which place he held for 10 years. He has been at the head of the Central Traffic Association since 1887.

Gold's Improved Sealed Jet for Hot-Water Heating.

Mr. Edward E. Gold, President of the Gold Car Heating Company, has brought out a hot water circulating apparatus for cars which are equipped with the Baker heater, and it is shown in the engravings herewith.

When steam is let into the coil equipped with the Gold "sealed jet" a complete circulation of the water takes place in from eight to eleven minutes and in a correspondingly short time when fire is used. On some roads it has been a practice to jet the steam into the water for the purpose of securing a more rapid circulation, but if this is done it is impossible to use salt water in the pipes, and they are liable to freeze up and burst.

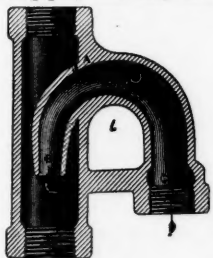


Fig. 2.

turn bend; but one port of the bend is carried into the vertical section, D, and this port is slightly tapered like the nozzle of a water hose. At the upper end of this nozzle there is a small hole, A, tapped $\frac{1}{8}$ in.

In this condition the jet is connected with the expansion drum, making only one connection into the drum. When steam is turned on the coil, and the water begins to heat and rise through the pipe J, it enters the jet at the opening C, passes around through the bend and owing to the taper of the nozzle is forced down the pipe with considerable energy. Any air which may be mingled with the water will rise to the drum as the water leaves the opening B.

The purpose of the $\frac{1}{8}$ -in. tapping in the nozzle is to

emit any particles of air that might settle in the jet proper when the pipes of the car are being filled with water. While this sealed jet can be used to great advantage on almost any hot water heating apparatus, it has given its best results when used in connection with Gold's duplex double coil, which produces a double or divided circulation, one of the pipes running around one side of the car and the other on the opposite.

This sealed jet has been found to work perfectly with either fire or steam, and it is now being rapidly applied to many cars equipped with hot water circulating apparatus. It can be easily fitted to a car with a Baker heater. It requires no auxiliary drums or jackets, which freeze and burst, and take up valuable space.

Many private cars belonging to railroad officials throughout the country have been fitted with this apparatus, and they are all producing the best results.

TECHNICAL.

Manufacturing and Business.

The Simonds drop door patented by Mr. Simond, of the Pittsburgh & Lake Erie, Pennsylvania, has been specified on 100 coal cars that are being built by the Barney & Smith Co. for the J. H. Summers Fuel Co., of Cleveland, O. Nearly 11,000 cars have been equipped with this drop door during the present year.

The Dunkirk Engineering Co., of Dunkirk, N. Y., has made an assignment to Henry Reynolds, of Sinclairville, N. Y. George M. Newton, President and heaviest stockholder, made a general assignment last week. The im-

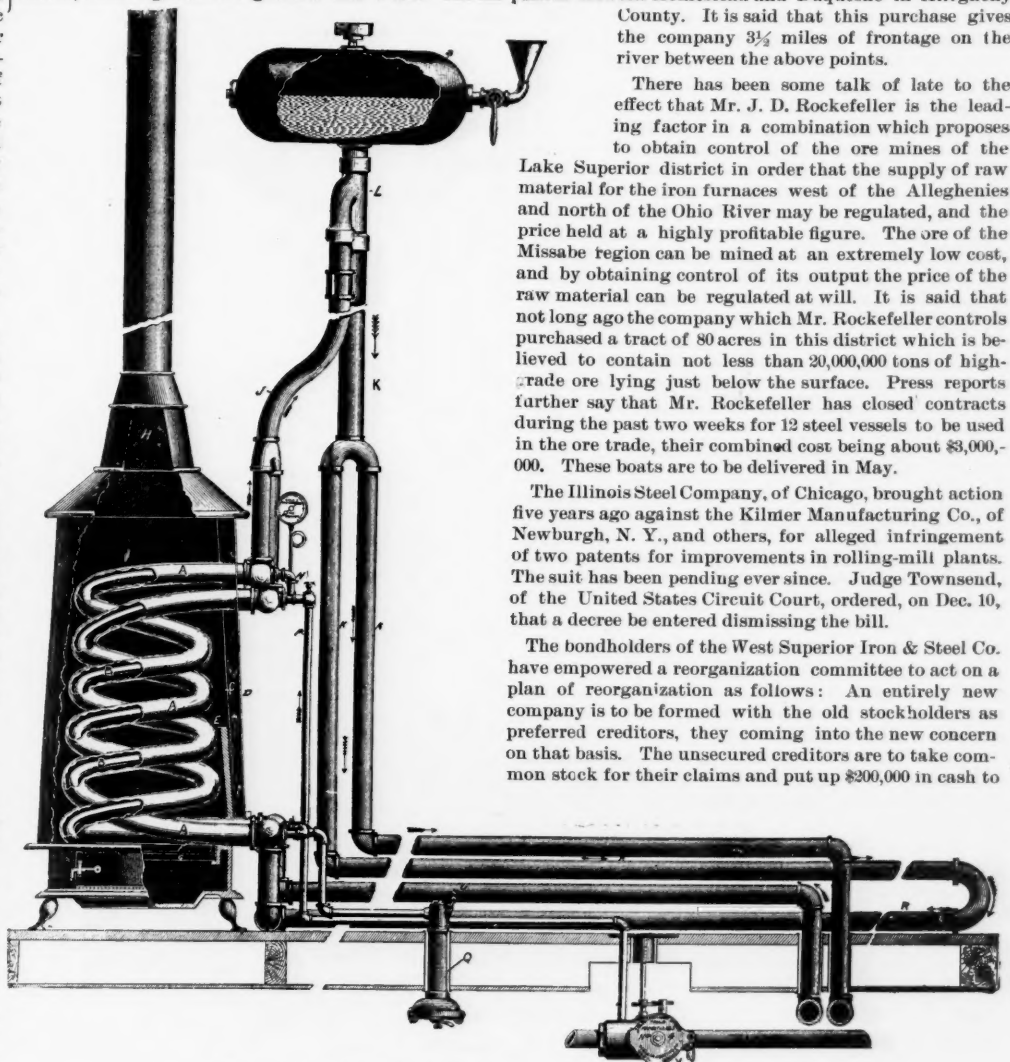


Fig. 1.—Hot Water Heating Apparatus with Gold's "Sealed Jet."

mediate cause of the failure, was the crowding by creditors. President Newton says the company would have come out all right if claims could have been postponed a little longer, as profitable orders were coming in.

The Alexander Nut Lock Mfg. Co., of New York City, filed a charter in New York last week, with a capital of \$20,000. M. H. Alexander, John W. Johnston and R. R. Brown, of New York City, are directors.

A large car-wheel plant is to be built at Pittsburgh by the Pittsburgh Car Wheel Company. The controlling interest in the company will be held by P. H. Griffin, T. Guilford Smith and other directors and officers of the New York Car Wheel Works of Buffalo. The Pittsburgh Car Wheel Company has been in existence for several years. It has built up a large business in street car wheels, but the wheels have been made at the Buffalo works of the New York Car Wheel Company.

The Boston & Maine has sold to Fuller & Lane, of Philadelphia, 10 old locomotives, mostly from the Connecticut River Division.

The M. Ohmer's Sons Co., of Dayton, O., manufacturer of filing cabinets, has removed its New York office to No. 73 Nassau street. Mr. George W. Cobb, Jr., is the company's agent.

New Stations and Shops.

The Berlin Iron Bridge Co. has just completed for the Standard Oil Co., at Constable Hook, N. J., a compounding building 120 ft. x 130 ft. The roof trusses are composed of steel, with steel purlins, and covered with galvanized corrugated iron.

Operations will begin about Jan. 1, at the Southern Railway's new machine shops at Burlington, N. C. Mr. F. S. Inge, the Master Mechanic, states that a new round-house will probably be built, as the present structure, which was built by the North Carolina Railroad before the lease of the property to the old Richmond & Danville, is too small to accommodate locomotives used on this division of the Southern. The other old buildings have been thoroughly overhauled and equipped with machinery, the last of it being placed in position this week. About 100 men will be employed.

Iron and Steel.

It is said that the Eureka Cast Steel Company has decided to start up its plant. The works are located at Lamokin station, Chester, Pa.

The *Iron Age* gives the production of pig iron on Dec. 1 as somewhat less than the production for Nov. 1, when the highest figures in the history of the trade were reached. The weekly capacity of the furnaces in blast Dec. 1 was 216,797 tons and on Nov. 1 it was 217,306 tons. The stocks on hand are not increasing very rapidly in spite of the very heavy production.

Press reports say that the Carnegie Steel Company has purchased about 74 acres of land on the Monongahela River between Homestead and Duquesne in Allegheny County. It is said that this purchase gives the company $3\frac{1}{2}$ miles of frontage on the river between the above points.

There has been some talk of late to the effect that Mr. J. D. Rockefeller is the leading factor in a combination which proposes to obtain control of the ore mines of the Lake Superior district in order that the supply of raw material for the iron furnaces west of the Alleghenies and north of the Ohio River may be regulated, and the price held at a highly profitable figure. The ore of the Missabe region can be mined at an extremely low cost, and by obtaining control of its output the price of the raw material can be regulated at will. It is said that not long ago the company which Mr. Rockefeller controls purchased a tract of 80 acres in this district which is believed to contain not less than 20,000,000 tons of high-grade ore lying just below the surface. Press reports farther say that Mr. Rockefeller has closed contracts during the past two weeks for 12 steel vessels to be used in the ore trade, their combined cost being about \$3,000,000. These boats are to be delivered in May.

The Illinois Steel Company, of Chicago, brought action five years ago against the Kilmer Manufacturing Co., of Newburgh, N. Y., and others, for alleged infringement of two patents for improvements in rolling-mill plants. The suit has been pending ever since. Judge Townsend, of the United States Circuit Court, ordered, on Dec. 10, that a decree be entered dismissing the bill.

The bondholders of the West Superior Iron & Steel Co. have empowered a reorganization committee to act on a plan of reorganization as follows: An entirely new company is to be formed with the old stockholders as preferred creditors, they coming into the new concern on that basis. The unsecured creditors are to take common stock for their claims and put up \$200,000 in cash to

be used in repairing and operating the works. Mr. John D. Rockefeller is said to be the largest bondholder.

Abolition of Grade Crossings at Newton.

The plans for the change of grade of the Boston & Albany at Newton, Mass., have been completed and the agreement has been approved by the city of Newton and by the railroad company. The Superior Court will be petitioned to appoint a commission of three men to supervise the work. This improvement involves the depression of the grade of the four-track main line of the Boston & Albany from Faneuil, 6 miles from Boston, to Auburndale, 11 miles from Boston, and there will be 17 overhead bridges. For a considerable part of this distance Washington street, an important thoroughfare, runs parallel to the railroad, and this street will be improved and widened. There are four small streams crossing the railroad, two of which will have to be deepened for over half a mile. The other two will be syphoned. Where valuable buildings stand close to the track retaining walls will be built, but for most of the length of the cut the sides will be sloped and turfed. There will be a new station house at Newton, but at Newtonville and West Newton the present buildings will be retained. The total cost of the improvement will be about \$2,000,000, which, we believe, does not in-

clude the widening of Washington street. It is stated that the city will pay 10 per cent., the state 25 per cent. and the railroad company 65 per cent.; but another account says the railroad pays only 55 per cent.

Chicago Main Drainage Canal.

On Dec. 11 the first regular meeting of the new Board of Trustees of the Sanitary District took place, President Eckhart assuming control and appointing his committees. He said in his message that the aggregate of expenditure called for by the existing contracts of the district based on the latest revised estimates amounted to \$19,080,846. Of this amount there has already been paid, for work performed, the sum of \$12,518,928, leaving a balance \$6,561,918 to be paid out during the year 1896, provided the contracts are completed within the time specified. The district can reasonably expect to obtain upon the tax levies of 1895, 1896 and 1897, about \$3,500,000 each year. The difference between the total amount available up to Dec. 1, 1896, and the amount due on contracts to be completed at that time is only \$76,030. This small margin means that the utmost care in handling the funds must be observed.

The work thus far spoken of is all on the main channel with such works connected that it may receive the prescribed amount of water; but efficient means must be provided for controlling the flow of water in times of flood in the Desplaines River. The furnishing of the water supply itself is no less important. An immediate supply of 300,000 cu. ft. per minute must be provided. This amount may be brought with safety through the Chicago River by deepening the channel and widening it at certain points or providing by-passes. The improvements in the Chicago River, Mr. Eckhart thought, should be borne in part by the Federal Government.

A New 20,000-Ton Steamer.

We spoke some time ago of the steamer Pennsylvania, which is being built for the New York service of the Hamburg-American Line by Harland & Wolff, of Belfast. This vessel, which is a twin-screw freight and passenger steamship, will be, it is said, the largest freight carrying steam vessel in the world when completed. The displacement will be 20,000 tons and her dimensions are about as follows: Length, 560, beam 62 and depth of hold 42 ft. The vessel will have triple expansion engines with a total horse power of 5,500. The White Star steamship Georgia is at present the largest cargo carrying steamer afloat, but she is not so large as the Pennsylvania will be. The speed of the latter, it is estimated, will be about 15 knots an hour. Accommodations will be provided for 200 first-class and 1,500 steerage passengers.

Interlocking at Toronto.

The Grand Trunk Railway of Canada has just completed its first large interlocking plant. This is at Toronto, covering the yard for a length of about 1½ miles; there are four towers. The whole of the apparatus came from England, having been made by Saxby & Farmer.

THE SCRAP HEAP.

Notes.

The Southern Pacific will require passenger conductors to give a bond of \$1,000 each.

The New York, New Haven & Hartford has increased the wages of freight brakemen west of New London from \$1.90 to \$2 a day and fireman from \$2 to \$2.10.

The number of men discharged from the shops of the Southern Pacific at Sacramento, Dec. 7, is given by the newspapers as 400 or 500, which is about one-fourth of the total force.

The Missouri, Kansas & Texas has taken possession of and is now operating the dining rooms in the stations at Nevada, Parsons, Savannah, Dallas, Hillsboro, Smithville, Sedalia and South McAlester.

The sleeping car built by the Harris Car Company about four years ago is now in the hands of the American Palace Car Co., a new concern which has an office at 246 Washington street, Boston. The car has lately been run with excursions to Atlanta and other places.

There is again a scarcity of water at Altoona, and the foundry of the Pennsylvania Railroad had to shut down on Dec. 14. Cold weather, freezing up the small streams, is the cause of the present famine. There is a similar recurrence of this trouble in the region of Hazleton, Pa., and some collieries have again suspended operations.

The Secretary of the Interior has directed the Commissioner of the General Land Office to suspend further action on land selections on account of the grants to the bond-aided railroads, that is, the main lines of the Union Pacific, Central Pacific, Kansas Pacific, Sioux City & Pacific and Central Branch, Union Pacific. The Secretary hopes that Congress at this session will clear up the whole vexed Pacific railroad problem.

The conductors and motormen of the street railroads in Philadelphia (the Union Traction Company) struck on Tuesday, Dec. 17, and stopped work. The company succeeded in keeping some cars running, but there was a good deal of violence. Disorder and rioting began early in the morning, and was continued until late in the afternoon. Motormen were pulled from their cars, windows broken and cars disabled. The Mayor issued a proclamation requesting citizens to observe peace and

order, and in the evening quiet was restored by no attempt being made to run any cars. The company raised fares a few weeks ago by abolishing the free transfer tickets that had been given to passengers changing cars at junctions, and the officers claim that the strike is precipitated now for the purpose of securing sympathy while the passengers have a grievance against the road. The employees have demanded higher pay and more regular hours, but their final grievance seems to have been the refusal of the president of the company to treat with a committee of their brotherhood, some or all of the members of which were not employees of the company. On the same day of the strike it was announced that the fare to Frankford, Manayunk, Chestnut Hill, Bridesburg and Fox Chase would be uniformly 5 cents, being a considerable reduction from former rates.

The Government and the Pacific Railroads.

The President in recent annual messages to Congress and the reports of the Attorney-General and of the Secretary of the Interior have pointed out the necessity, from the Government standpoint, of some action by Congress to adjust or settle the claim of the United States against the Pacific Railroads. The report of the Secretary of the Treasury contains the following reference to the maturing indebtedness:

"The affairs of the companies now appear to be approaching a condition which will seriously embarrass the executive officials charged with the general supervision of the matter, and almost certainly result in a great loss to the Government, unless averted by prompt action on the part of Congress. Since the report of 1893, was made bonds for \$2,362,000, issued to the Central Pacific, and for \$640,000, issued to the Kansas Pacific, have matured and been paid by the United States, and on Jan. 1, 1896, more bonds will mature, viz., \$1,600,000 issued to the Central Pacific, \$1,440,000 issued to the Kansas Pacific, and \$640,000 issued to the Union Pacific. On Feb. 1, 1896, other bonds issued to the Union Pacific for \$4,320,000 will become due. The sinking fund of the Central Pacific, consisting of cash and bonds amounting to \$6,254,556, and the sinking fund of the Union Pacific, consisting also of cash and bonds, amounts to \$15,346,037.

"The total amount due and to become due on or before Jan. 1, 1899, is \$64,623,512, exclusive of interest, and it is evident that unless some adjustment is made under the authority of an act of Congress the payment of this large sum, with accruing interest, must be provided for within the time named. If the property of the companies should unfortunately be forced to sale under foreclosure proceedings before further provision is made by Congress to protect the interests of the Government by increasing its security or otherwise, no public official, with the limited authority now conferred by law, will be able to save any considerable part of this large claim."

Lake Notes.

During the past season the whaleback steamer Colgate has made 19 round trips between Duluth and Buffalo, pulling a barge, their combined cargoes being 5,000 tons a trip. They have carried the equivalent of 3,135,000 bu. of wheat down the lakes during the season. Several of the steamers of the Minnesota Iron Co., have made 26 round trips to Cleveland during the year, carrying cargoes only one way. The experiment of this company with two steel barges has been very successful, the time of round trip for steamer and barge being only one day more than that of steamer alone; the coal consumption was not greatly increased by the tow, while the cargo capacity was doubled. The company will ultimately have barges for every one of its steamers and is now building three of the largest size.

Detailed information as to the late order for vessels given by Pickands, Mather & Co., for the individual account of John D. Rockefeller and the Minnesota Iron Co., is as follows: The ships are to be built at lake yards as follows: Chicago Shipbuilding Co., one steamer 400 ft. keel; three barges, each 352 ft. keel; Globe Iron Works Co., two steamers, each 412 ft. keel; Detroit Dry Dock Co., two steamers, each 413 ft. keel; F. W. Wheeler Co., one steamer 408 ft. keel, two barges, each 354 ft. keel; American Steel Barge Co., one steamer, 404 ft. long, one barge 307 ft. long; Cleveland Shipbuilding Co., one steamer, 406 ft. keel. With the exception of the last named, these vessels are to be ready Aug. 15 next, and will add about 800,000 tons to the tonnage for next year. The average engine power of the steamers is 2,000 H. P., and they will all have double or triple compound engines. The cost of the entire fleet is put at about \$3,000,000. It was the success of the whaleback and Minnesota Iron Co.'s tow barges that led to the construction of barges for the new steamships of this mammoth order. There is no such significance in the Rockefeller order as figured by the daily press, it meaning simply that he has the carrying of an immense quantity of ore and proposes to get a profit from the lake haul as well as from the rail haul.

An order has been placed with the American Steel Barge Co., at Superior, for one steel oil carrier, similar to two recently built by that company for the Standard Oil Co. This vessel will not be out till 1897, so great is the pressure of work at the yard.

By virtue of recent contracts there is now work at lake yards that will keep all, except two, busy till near the close of the shipping season of 1896. These two are the yards of the Union Dry Dock Co., at Buffalo, and of Craig & Son, at Toledo. It is likely that these two will be filled shortly. The shipbuilding trade has not been so good for years if ever.

Lake Superior Railroad Improvements.

At the present time there is the greatest activity in the construction of equipment and improvements to the iron ore railroads of the Lake Superior district. One road, the Lake Superior & Ishpeming, is being built; another, the Duluth & Iron Range, is being double-tracked for much of its length, and four are constructing immense ore docks. These docks will consume in the aggregate not less than 23,000,000 ft. of lumber, and will require the labor of 1,000 men all winter. They are preparing for the most active year in their history, and will ship to market next season all the ore that can be taken by the vessels on the lakes. This will be limited somewhat by the fact that there is an enormous quantity of other freight awaiting shipment. It is estimated that there are 300,000,000 ft. of sawn timber on dock at Lake Superior ports, while 25,000,000 bu. of grain at Duluth and 50,000,000 bu. at Chicago and in the tributary country will tax the grain fleet in the early days of the year. At the opening of navigation there will be at Duluth as much flour as can be stored, and all these commodities will have to go forward. The increase of tonnage over last year, estimated at about 2,000,000 tons for 1896, will be needed.

At the head of Lake Superior the Duluth & Iron Range is double-tracking with 80-lb. rails much of its main line. It will soon contract for an ore dock of 200 pockets of the most modern construction, and in which about 6,000,000 ft. of timber will be used. This will give the road five docks and enable it to easily handle the 3,000,000 tons its officials expect to have next season. It has closed the conditional order given the Baldwin Works for ten large locomotives, and will have several hundred new cars. The Duluth, Missabe & Northern road is building an ore dock of about the same size, which will increase its capacity 50 per cent., and give it a working storage for about 70,000 tons. It expects to haul 2,200,000 tons of ore in the year. It is building 400 ore cars, but doing little else in the way of new work, except taking up 60-lb. rails on the main line and replacing them with heavier rails. The Duluth & Winnipeg has let a contract for a dock of 150 pockets, which will give it three times the former capacity. It will handle over 400,000 tons. It will also have several hundred cars, and probably some locomotives, which may not, however, be new. The Ishpeming & Lake Superior is under construction by Winston Bros., of Minneapolis, and will be completed by July. It will also have a 200-pocket ore dock, 53 ft. high. This road is being built by some of the leading mining companies of the Marquette district, and will handle some ore formerly carried by the Duluth, South Shore & Atlantic. On the Gogebic range the Wisconsin Central road is increasing the capacity of its dock about 40 per cent., and is laying new track, improving its road-bed, and otherwise preparing for a business of much greater proportions than the 1,100,000 tons it carried in 1895. The docks referred to will cost not far from \$1,250,000, and will give steady employment to many mills during this winter, for the timber required must be sawn to order, and must be had before spring. Much of it must come from the Pacific coast by rail.

CAR BUILDING.

The Louisville, New Albany & Chicago has recently ordered 100 new stock cars.

The Portland & Rochester has let the contract for 15 gondola coal cars of 60,000 lbs. capacity to the Laconia Car Co., Laconia, N. H.

The receiver of the Toledo, St. Louis & Kansas City road has been authorized by the United States Court, under whose authority the road is being operated, to purchase 500 gondola cars. This is the number that Receiver Peirce asked authority to contract for, as noted in this column some weeks ago.

The New York, New Haven & Hartford has received about 100 of the 500 freight cars building for that road by the Michigan-Penninsular Car Company. These cars weigh about 29,000 lbs. each and have a capacity of 30 tons. They are 33 ft. 4½ in. long, and are fitted with M. C. E. couplers, air-brakes and have Fox pressed steel trucks. The cars are being delivered at the rate of about 25 a day.

The Milton Car Works (Murray, Dougal & Co.), Milton, Pa., has received contracts as follows: 100 hopper-bottom gondolas (Pennsylvania Railroad standard) from Black Lake Coal Co.; 8 tank cars, 66,000 gals. capacity, from Paragon Refining Co., and 57 tank cars from the Manhattan Oil Co. The shops are also busy at work completing the order for 250 gondolas from the Pennsylvania awarded some time ago.

BRIDGE BUILDING.

Ashland, Wis.—The Minneapolis, St. Paul & Ashland Railroad will do considerable bridge and trestle work along the line between Ashland and the Duluth, South Shore & Atlantic Railroad. The McGeehan Construction Company, of Ashland, will receive bids for this work.

Atlantic Highlands, N. J.—It is said that a 50-ft. steel and concrete bridge, to cost about \$3,000, is to be built over Grand avenue at this place.

Brooklyn, N. Y.—Dean & Westbrook, the contractors who built the new Meeker Avenue bridge across Newtown Creek, are trying to collect \$24,000 from the officials of Queens County, which they say is due them for changes in plans and loss by delay on the work.

Chambersburg, Pa.—The Grand Jury has disapproved of a bridge over Rush Creek, Antrim Township.

Cohoes, N. Y.—It has been decided to build a new bridge over the Erie Canal at High street, this place. A temporary bridge will probably be built by the owners of the store and freight houses along the N. Y. C. tracks, which will be used while the new bridge is being built.

Corpus Christi, Tex.—It is reported that plans have been prepared for two new bridges which will soon be constructed over Barbours Creek.

Danville, Pa.—The Town Clerk has been authorized to ascertain the probable cost of erecting either a wooden or iron bridge over the canal at Wall street.

Denver, Col.—The Gunnison River Bridge Co., which proposes to build the bridge over the Gunnison River at Delta, was incorporated Dec. 12, with a capital stock of \$10,000. The incorporators are Henry Kohler, Jesse C. Hart and F. H. Bullen.

Detroit, Mich.—Press reports say that notice has been given that the Canadian & American Bridge & Tunnel Co. will apply to Parliament at its next session for permission to build a high-level bridge over the Detroit River between Windsor and Detroit.

Easton, Pa.—Some dimensions of the new iron bridge to be built across the Delaware at this place are as follows: The bridge is a cantilever. There are two river piers with a channel space 300 ft. between them. The piers are 11 ft. thick at the base and 7 ft. at the top and are 32 ft. above low water. The shore ends of the span are anchored by means of eye-beams imbedded in concrete. The bridge is to be built entirely of steel except the lateral bracing, which is iron. The electric railroad tracks will divide the 36-ft. wagon road space. Eighty pound girder rails will be laid for this road. The entire weight of the bridge is about 1,700 tons. The bridge is 550 ft. long and 62 ft. wide. From low water to the tops of towers is 77 ft. There are footwalks on brackets on each side of the bridge, 10 ft. wide. Plans and specifications of the bridge were drawn for the Delaware Bridge Company by Prof. J. M. Porter, of Lafayette College.

The city will erect a new iron bridge at the foot of South Tenth street, crossing the tracks of the Central Railroad. The present wooden structure, it is thought, may collapse at any time. City Engineer Fehr has

awarded the contract to Tippet & Wood, of Phillipsburg, for \$575. H. O. Duerr, of South Bethlehem, bid \$721, and Joseph Pascoe, of South Easton, \$579. The bridge will be 57 ft. long and 6 ft. wide, and clear the railroad track 20 ft.

Escanaba, Mich.—It is reported that the County Commissioners have asked for bids for a new bridge over the Whitefish River in Masonville Township.

Hartford, Conn.—The Berlin Iron Bridge Company has accepted the award of the State Commission in the matter of the contract made with the state, under the law of 1893, for building the new \$250,000 East Hartford bridge. The amount of the award is \$27,526, and the bridge company releases all claims under its contract made with the old Bridge Commission.

The company has also sold to the new Bridge Commission, created by the General Assembly of 1895, the present temporary bridge for \$18,000. This leaves the way clear for the new commission to go ahead and build a new permanent structure.

Middletown, Conn.—The directors of the Middletown-Portland bridge have voted to issue \$100,000 worth of 20-year bonds secured by a mortgage on the property owned by the bridge company.

Newark, N. J.—We noted some weeks ago the defeat of a plan for a bridge over the Passaic River from Fourth street, Harrison, to Madison street, Newark. This bridge may yet be built, and its cost, which is estimated at about \$100,000, will probably be divided between Hudson and Essex counties.

New York.—The New York and New Jersey Bridge Commission presented to the Sinking Fund Commission, on Dec. 13, three sets of plans for the proposed bridge terminus at Fifty-ninth street and the North River. The first plan calls for a viaduct 60 ft. high, running from the bridge to Tenth avenue, then turning to the north to Sixtieth street and running along that street east to Columbus Square, the plot of ground now occupied by Durland's Riding Academy, between Sixtieth and Sixty-first streets, to be used for a station. The second plan calls for a similar viaduct running from the bridge down Eleventh avenue to Fiftieth street, then east over the blocks between Forty-ninth and Fiftieth streets to Ninth avenue, the land between Ninth avenue and Broadway from Fortieth to Fifty-first streets to be occupied by a station. In the third plan the viaduct runs down Eleventh avenue to the block between Forty-second and Forty-third streets, then eastward to Ninth avenue, using for switches and a station all the land between Ninth and Seventh avenues, Forty-second and Forty-fourth streets.

Oil City, Pa.—There is some talk of building a new bridge over Oil Creek at this place.

Philadelphia, Pa.—The West Jersey Railroad Company is reported to have a large force of men at work rebuilding the Townsend inlet bridge.

Pittsburg, Pa.—The East Pittsburg Council has decided that the old Brinton stone bridge shall be torn down. It was built by the Pittsburg & Cornellsville Railroad, and now stands in the way of street improvements.

Portland, Ore.—It is reported that the O. R. & N. Railroad intends to build a new bridge over Hood River near this place.

Providence, R. I.—A highway bridge with a 210-ft. draw span and three 88-ft. shore spans has been completed at this place. The bridge is known as the Central bridge and is over the Seekonk River at what is known as Narrow Passage. The bridge was built by the Union Bridge Company, John T. Tank being the contractor for the substructure. The plans were prepared in the city engineer's office under the direction of William D. Bullock, Assistant Engineer in Charge of Bridges.

Raleigh, N. C.—The Wake County Board of Commissioners last Saturday ordered Road Supervisor W. C. McMackin to build a new covered bridge over Crabtree Creek, near Raleigh. The bridge will be of wood and iron, to cost about \$1,000.

Reading, Pa.—The councils have sustained Mayor Shanahan's veto of the resolution calling upon the City Solicitor for an opinion as to the legality of the ordinance compelling the Reading Railroad Company to construct and maintain a crossing at Second street and the Lebanon Valley Railroad. Mayor Shanahan holds that the putting in force of such a resolution would work great injury to the erection of a new bridge at Front street and Lebanon Valley Railroad by the company, more greatly needed.

St. Louis, Mo.—Senator Vest has introduced into Congress a bill for a new bridge between St. Louis and East St. Louis. It gives authority to the East St. Louis & St. Louis Bridge Construction Co. to build a bridge across the Mississippi from some point suitable to the interests of navigation between the north and south lines of St. Clair County, Ill., with the proviso that the plan and location shall be recommended, in the interests of navigation, by a board of three United States engineers to be appointed by the Secretary of War.

Sunbury, Pa.—The Grand Jury has recommended the erection of two bridges over Muddy Run Creek, and disapproved the petition for a bridge over Carbon Run in Shamokin.

Syracuse, N. Y.—A lift bridge will probably be built over the railroad tracks at West Genesee street, and plans are now being made for the same.

Warren, Pa.—The Philadelphia & Erie Division of the Pennsylvania will rebuild the bridge at this place early next spring. At present it consists of three 150-ft. wooden Howe truss spans, single track. It will be replaced by a double track iron or steel structure. The site was visited recently by Robert Neilson, General Superintendent; J. T. Richards, Engineer Maintenance of Way, and C. A. Preston, Principal Assistant Engineer, and by them the reconstruction was recommended.

Washington, D. C.—A bill has been introduced in the House to appropriate \$100,000 for a bridge over the Potomac River to Arlington cemetery.

Westerly, R. I.—The New York, New Haven & Hartford is preparing to build a bridge over its tracks at High street.

Wilkes-Barre, Pa.—W. H. Sturdevant, Chief Engineer of the Wilkes-Barre & Wyoming Valley Traction Co., writes as follows: Bids will probably not be received before next spring for a viaduct 1,075 ft. long over steam tracks to be built for the Wilkes-Barre & Wyoming Valley Traction Co.

Williamsport, Pa.—The Grand Jury recommends the erection of a bridge across Cedar Run, in Brown Township.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Belfast & Moosehead Lake, semi-annual, \$3 per share on preferred stock, and \$1.44 on non-preferred.

Chicago Junction & Union Stock Yards, quarterly, 1½ per cent. on preferred stock, and semi-annual, 4 per cent. on common stock, payable Jan. 2.

Denver & Rio Grande, 1 per cent. on preferred stock, payable Jan. 15.

Fitchburg, semi-annual, 2 per cent. on preferred stock, payable Jan. 15.

Manhattan, quarterly, 1½ per cent., payable Jan. 2.

Minneapolis & St. Louis, semi-annual, 2½ per cent. on first preferred stock, and 1½ per cent. on second preferred stock, payable Jan. 15.

Suffolk & Carolina, \$1 per share, payable Dec. 24.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Allentown, annual, company's office, Reading Terminal, Philadelphia, Jan. 13.

Chelsea Branch, annual, company's office, Delaware and Federal streets, Camden, N. J., Jan. 6.

Pickering Valley, annual, company's office, Reading Terminal, Philadelphia, Jan. 13.

Philadelphia & Reading, annual, company's office, Reading Terminal, Philadelphia, Jan. 13.

Reading & Columbia, annual, company's office, Reading Terminal, Philadelphia, Jan. 13.

Rome, Watertown & Ogdensburg, annual, company's office, New York, Dec. 28.

Western New York & Pennsylvania, company's office, 104 South Fifth street, Philadelphia, Jan. 13.

New York Railroad Club.

At the meeting, on Thursday evening, Dec. 19, Mr. L. R. Pomeroy read a short paper on Balanced Slide Valves. A topical discussion on The Causes of Train Detentions was taken up.

The Civil Engineers' Club of Cleveland.

The regular meeting of the Civil Engineer's Club of Cleveland was held Tuesday evening, December 10, at 7.45. There were present 87 members and visitors. Mr. George De Leval read a paper on the Crank and Fly Wheel versus The Direct Compensating Pumping Engines, which was discussed by Messrs. H. G. H. Tarr and J. F. Holloway.

Toledo Superintendents' Association.

At a meeting of the Railway Superintendents' Association at Toledo last week the following officers were elected: T. F. Whittelsey, President; A. L. Matts, Vice-President, and Wm. Grogan, Secretary and Treasurer. An executive committee, composed of L. E. Johnson, F. A. Husted, A. L. Mills, W. H. Potter and Robt. Blickenderfer was also elected.

Northwest Railroad Club.

The Northwest Railroad Club held its regular meeting in the Ryan Hotel, St. Paul, Dec. 17, about 40 members of the club being present. A discussion on locomotives was introduced by C. Seeley, of the Chicago Great Western; William McIntosh, of the C. St. P. M. & O., read a paper on Hard Times. H. H. Vaughan, of the Great Northern, read a paper on The Hauling Capacity of Locomotives.

The Western Railway Club.

At the meeting on Dec. 17, the discussion was on Air-Brake Equipment on Freight Cars, based upon the paper presented at the November meeting by Mr. A. M. Waitt.

There was also a topical discussion on Piece-Work in Car Shops, introduced by Mr. G. L. Potter, S. M. P. Pennsylvania lines. A paper on Locomotive Service, by Mr. J. H. McConnell, S. M. P. Union Pacific, was read.

Roadmasters' Association of America.

The executive committee of the association met at the Great Northern Hotel, Chicago, on Dec. 9, as noted in this column last week. The following list of subjects for discussion at the next annual meeting was agreed to, and the committees named appointed:

1. Tie Plates.—The benefits and results obtained from their use. Will their use dispense with the use of rail braces: Robert Hall, chairman, Manhattan Ry., New York; A. Morrison, Lehigh Valley, White Haven, Pa.; J. B. Moll, C. M. & St. P. Ry., Chicago; George W. Light, M. T. Sta., Detroit; R. Hyland, Fitchburg, Keene, N. H.; J. C. Hechler, Denver & Rio Grande, Pueblo, Col.

2. Best method of protecting facing-point switches.—W. D. Otis, Chairman, N. Y. C. & H. R., New York; R. Caffrey, L. V. R. R., So. Bethlehem, Pa.; A. S. Weston, N. Y. C. & H. R., Rochester, N. Y.; E. J. Shanessy, G. R. & I., Big Rapids, Mich.; C. Markham, C. & W. M., Holland, Mich.

3. Elevation of rail for each degree of curves for speed of 10, 20, 30, 40, 50, 60 and 70 miles an hour and the advisability of using easement curves.—Garrett Davis, Chairman, B. & O. R. R., Cedar Rapids, Ia.; L. O. Walker, P. T. & A., Paducah, Ky.; H. G. Hetzler, C. B. & Q., Chicago; John Doyle, C. & W. M., Grand Rapids, Mich.; G. W. Merrell, C. M. & St. P., Milwaukee.

4. Latest improvements in frogs and switches.—J. A. Lahay, Chairman, C. & N. P., Chicago; A. S. Lippert, N. Y. C. & H. R., Buffalo, N. Y.; G. D. Gifford, N. Y. C. & H. R., Rochester, N. Y.; A. Philbrick, Illinois Central, Chicago; P. Madden, C. M. & St. P., New Lisbon, Wis.

5. Rail joints.—C. P. Blue, Chairman, Illinois Central, Jackson, Tenn.; J. B. Moll, C. M. & St. P., Chicago; J. W. Wright, C. & N. W., Baraboo, Wis.; Geo. M. Brown, F. & P. M., Saginaw, Mich.; Wm. Brands, C. & N. W., Sparta, Wis.

6. Ballast.—What is the best kind of ballast? What is the best method of handling ballast? What is the best cross-section for each kind of ballast, both as to roadbed and ballast?—W. H. Courtney, Chairman, L. S. & M. S., Coldwater, Mich.; T. Hickey, M. C. R. R., St. Thomas, Ont.; W. D. Otis, N. Y. C. & H. R., New York; W. H. Burns, N. Y. C. & H. R., Batavia, N. Y.; F. R. Doty, Illinois Central, La Salle, Ill.

Committee of Arrangements for the next convention is: W. D. Otis, Chairman, N. Y. C. & H. R., New York; A. S. Weston, N. Y. C. & H. R., Rochester, N. Y.; T. Hickey, M. C. R. R., St. Thomas, Ont.; W. E. Emery, W. N. Y. & P., Oil City, Pa.; R. Caffrey, L. V. R. R., So. Bethlehem, Pa.

Two papers will be read, one by Mr. J. M. Meade, Resident Engineer of the Atchison, Topeka & Santa Fe at Pueblo, Col., on "Ditching," the second by Mr. John Doyle, of the Chicago & West Michigan, on "The relation between the rail and the load it is now carrying."

American Society of Civil Engineers.

On Dec. 18, 1895, Dr. Thomas Eggleston, Chairman of a Committee of the American Meteorological Society, on "An International Metric Gage," addressed the Society on the work accomplished by his committee and general discussion followed.

Mr. Rudolph Hering spoke of some recent experience in the use of asphalt for reservoir linings.

The first Wednesday of January, 1896, falls on New Year's Day, and no paper has been assigned for presentation for that evening. The usual collation will also be omitted.

By order of the Board of Direction, a special meeting will be held on Wednesday, Jan. 8, 1896, at which a paper by W. W. Foiet, M. Am. Soc. C. E., on "Cost of Sewer Construction, Denver, Colo.," will be presented, and the usual collation served. The following is an abstract:

COST OF SEWER CONSTRUCTION, DENVER, COLO.

The paper describes the construction and cost of a sewer of the following general dimensions:

Section.....	1	3	5	6	7	8	9
Length, feet.....	2,393	1,714	211	503	947	1,396	1,094
Diameter, inches.....	94	70	70	70	77	77	77

Section 2 of the work is a spillway, which is illustrated in the paper. Section 4 is a levee about 3,200 ft. long, 10 ft. high and 8 ft. wide on the top, and Section 10 is a wooden box sewer 3½ x 3½ ft. inside measurements. The conditions under which the construction was carried on were varied. Fairly deep excavation to reach grade was required at places, and in other sections the sewer had to be banked over. Some of the excavation was in very wet ground, while other portions were in soft rock.

The method in which the cost of the work was itemized is explained, and seven tables are given, in which the various items of the total expense are stated in detail.

Mr. E. P. Martin, the Chief Engineer of the Board of Public Works, devised a steel ring for supporting the centering used by the masons. The ring consists of two semi-circles of 8-lb. steel, a section being taken having a height equal to the thickness of the lagging. The lower semi-circle has the flange toward the center, and its outer radius is that of the invert of the sewer. The upper semi-circle has the flange on the outside, and its radius is shortened to allow for the thickness of the lagging. To each end of the lower half is riveted a short piece of the same section of rail with a hole punched in the flange, a corresponding hole being punched in each end of the upper half. One of these pieces has its upper end cut on a slight bevel, corresponding to a similar bevel on the end of the upper semi-circle. The halves are joined by two lugs and bolts at each end. The lagging was dressed from 2 x 4-in. stuff, and was given radial joints. Each piece was provided with three small iron clips on the lower side, which fitted over the flange of the rings and held the lagging in place.

The Railway Signaling Club.

A regular meeting of the Railway Signaling Club was held in Chicago Dec. 10. The subject for discussion was the paper by Mr. W. H. Elliott on electric locking, presented at its November meeting, and which was printed in the *Railroad Gazette* of Dec. 6. Mr. Wileman (L. S. & M. S.) opened the discussion by quoting a case of a derailment which had recently occurred on his road, in which a derailing switch had been deliberately thrown under a train. This was possible on account of the location of the switch upon a curve which was so wide of gage that the tread of the wheels did not cover the detector bar which was on the inside rail of the curve. This showed the desirability of electric locking which would prevent the movement of the lever as long as the track circuit was covered by the train.

Mr. Miles (M. C.) thought Mr. Elliott's arrangement objectionable in large plants because of the large number of track insulations required, and suggested the use of track instruments instead. One of these could be placed beyond the distant signal in one direction, and the releasing instrument beyond the limits of the interlocking in the other direction. After considerable discussion the opinion seemed to prevail that track circuits are preferable, as they detect the presence of a single pair of wheels.

Mr. E. F. Moore, Mechanical Engineer for the Commissioner of Railroads of the State of Michigan, quoted a number of cases of derailment which had occurred in that state on account of switches having been changed after the corresponding signals had been cleared. He considered electric locking very desirable, and expressed a conviction that unless details are electrically locked, the distant signals governing routes over them should be fixed in position, and should be used only to signify to the engineer that he was approaching an interlocking plant. Mr. Moore seemed to be nearly resolved to recommend that electric locking should be required in connection with all of the interlocking works put up in Michigan.

This discussion was followed by a paper by Mr. W. W. Salmon, General Agent of the Hall Signal Co. upon Automatic Switch Indicators which will be found in another column. The rest of the evening was devoted to topical discussion which was of unusual interest. The subject of the maintenance of track in connection with interlocking plants was introduced by Mr. H. M. Sperry (N. S. & C. Co.), who exhibited a sketch of a section through the stock and point rail of a switch located on a curve of which the stock rail had worn so badly upon the head that a derailment occurred on account of a flange climbing the point when the switch was thrown for the siding. The turnout was upon the inside of the curve.

Mr. W. McC. Grafton (Pennsylvania Lines west of Pittsburgh) considered the signal maintainers to be partly at fault for allowing a switch to get into such a dangerous condition. He also showed that a sharp flange would be likely to cause a derailment at such a switch even if the latter was not badly worn. For protection from such difficulties at interlocking plants he had adopted a lock attachment which was so rigidly secured to the stock rail as to force the lock to follow the motions of the rail. In this way the point and stock rails were locked securely together. A brief discussion was held on pipe connections for distant signals, and Mr. Grafton said that whereas several years ago his road had discarded distant signals operated from the tower, that now they were being used again; but they were all being connected up with pipe lines to the towers.

PERSONAL.

—Mr. A. E. Brown, formerly Locomotive Engineer on the same road, has been appointed General Foreman of the shops at Somerset, Ky.

—Mr. J. F. Youse, formerly General Freight Agent of the Ohio Southern, has been appointed General Freight Agent of the Columbus, Hocking Valley & Toledo road.

—Mr. George Rockwell, formerly General Passenger Agent of the Cleveland, Akron & Columbus, has been appointed auditor of the Western Lines Passenger Association.

—Mr. George West, Chief Clerk of the Traffic Department of the Monterey & Mexican Gulf road at Monterey, Mex., has been appointed Traffic Agent of the line in New York City.

—Mr. John W. Midgley, Chairman of the Western Freight Association, has written an article for the January number of the *Forum* on "Railroad Rate Wars: Their Cause and Cure."

—Mr. W. S. Hoskins, formerly General Superintendent of the Victoria division of the Southern Pacific, in Texas, has accepted a position in the office of Manager W. G. Van Vleck in Houston.

—Mr. I. W. Fowle, who has been Master Mechanic of the first district of the Cincinnati, New Orleans & Texas Pacific, at Somerset, Ky., for about three years, has resigned to engage in other business.

—Mr. W. S. Thorne has been made Assistant General Passenger Agent of the Minneapolis, St. Paul & Sault Ste. Marie road, having his headquarters at St. Paul. He has recently been Local Agent at Minneapolis.

—Mr. Edward Wilder, who has been Secretary and Treasurer of the Atchison, Topeka & Santa Fe for many years, was last week re-elected to the same offices by the directors of the new company at a meeting at Topeka, Kan., last week.

—Mr. William W. Willson, General Manager of the Houston City Street Railway Co., has been appointed General Manager of the Gulf, Beaumont & Kansas City road, a new line in Eastern Texas. His office will be in Beaumont, Tex. Mr. Willson has been Assistant General Manager of the road.

—Mr. Philip Campbell, General Manager of the Birmingham, Sheffield & Tennessee River road, in Northern Alabama, has resigned that position and will remove to New York City. His successor will be Mr. Samuel Hunt, of Cincinnati, who is General Manager of the Cincinnati, Portsmouth & Virginia and other roads in which his friends have financial interests.

—Mr. P. H. Schreiber, who has been Master Mechanic of the second district of the Cincinnati, New Orleans & Texas Pacific for the past six years at Chattanooga, Tenn., has had his jurisdiction extended over the entire Chattanooga Division, with charge of the Somerset shops in connection with those at Chattanooga. His headquarters will be at Chattanooga, as heretofore.

—Mr. John A. Whaling, Purchasing Agent of the Wisconsin Central, has resigned, and will be succeeded Jan. 1 by A. D. Allibone. Mr. Whaling will give his time hereafter to the duties of Treasurer of the Metropolitan Iron & Land Company. Before going to the Wisconsin Central he was for 13 years Storekeeper of the Chicago, Milwaukee & St. Paul road. Mr. Allibone was for a number of years connected with the Milwaukee, Lake Shore & Western.

—Captain A. H. Swanson, formerly Receiver of the St. Louis, Arkansas & Texas, has recently been appointed Manager of the Whitney Iron Works, of New Orleans. Major Swanson is one of the best known of the older railroad men of the Southwest. For a great many years he was General Superintendent of the Houston & Texas Central until his appointment in 1887 as Receiver of the "Cotton Belt." That position he held until 1893, and since then he has been located at New Orleans.

—In announcing last week the promotion of Mr. A. C. Bird, of the Chicago, Milwaukee & St. Paul, from Freight Traffic Manager to be General Traffic Manager, we gave him the latter office on the Chicago, Burlington & Quincy. This was a slip of the pen; there was not even a report that he had gone to the Burlington. Vice-President Ripley, who has resigned to go to the Atchison as President, had charge of the traffic affairs of the Chicago, Milwaukee & St. Paul, and those duties will now be assumed by Mr. Bird, as was stated last week.

—Mr. Theodore Cooper, Professor William H. Burr and Mr. J. R. Croes, of New York, have been appointed a Board of Experts to examine the work on the Harlem River Speedway, which is designed to be a road-way about 100 ft. wide along the south side of the Harlem River in the northern part of New York City. The first section has been built, but the work done on the roadway has been condemned by the Engineer of the Park Board, and the Board of Experts is to report as to whether the responsibility for the poor work on the roadbed shall be placed upon the engineers or the contractors.

—Mr. S. B. Fisher has recently been appointed Assistant Chief Engineer of the Missouri, Kansas & Texas. He is at present in charge of the engineering department of the company. Mr. Fisher has been recently Superintendent of the Everett & Monte Cristo Railroad in Washington state. This is a line about 60 miles long built two or three years ago by Mr. Fisher as Chief Engineer, and involved some very heavy construction work. Before that appointment Mr. Fisher had been Chief Engineer of the Minneapolis, St. Paul & Sault Ste. Marie for about two years, and for the five years previous to 1890 he had been Chief Engineer of the Milwaukee & Northern. He began his railroad experience in the engineering department of the Pennsylvania.

—Mr. F. G. Darlington, Superintendent of the Indianapolis Division of the Pennsylvania, is to retire shortly from that position. Mr. Darlington is at present in New York, where he has been for some time under medical treatment. He has been Division Superintendent on several Pennsylvania lines for about 10 years. Like most of the other division superintendents of the Pennsylvania he was educated in the engineering department, rising through the various grades in that department. He has been with the Pennsylvania since 1878, when he became a transitman on the Panhandle. He was Engineer of Maintenance of Way on the Cincinnati & Muskingum Valley and the Pittsburgh Division, and became Engineer of the former division in 1886, being transferred to the Indianapolis Division in 1890.

—Mr. Thomas D. W. Cuyler, Vice-President of the Keokuk & Western, has been elected President of the new company, resulting from the acquisition of the Des Moines & Kansas City by the Keokuk & Western. Other important changes made in the organization of the consolidated company are the election of Mr. F. T. Hughes, formerly President of the Keokuk & Western, as counsel; the election of Mr. A. C. Goodrich, formerly General Manager and Chief Engineer of the Keokuk & Western, as General Manager; and of A. Macrae, formerly Assistant General Freight Agent as General Freight Agent; J. P. Boyle, formerly Superintendent of Telegraph, is made General Superintendent; R. D. Lewis is made Purchasing Agent, this position having formerly been held by Mr. Goodrich.

—Mr. W. C. Brown, who is at present General Manager of the Western lines of the Chicago, Burlington & Quincy, will, it is announced, succeed Mr. Merrill as General Manager of all the lines of the company. Mr. Howard Elliott, of St. Louis, at present General Freight Agent of the Burlington's Western Lines, according to

the same story, will become General Manager of the Western Lines. Mr. Brown's present title is General Manager of the Hannibal & St. Joseph and the Kansas City, St. Joseph & Council Bluffs roads. He has been with the Burlington lines nearly 20 years. He went to the road as train dispatcher, having previously held that position on the Illinois Central, the Rock Island and other Western roads. He was promoted through the various grades until he became Division Superintendent in 1887, being appointed to his present position in 1890.

—Mr. W. F. Merrill, for some years General Manager of the Chicago, Burlington & Quincy, has resigned that office, to take effect Jan. 1. He has accepted the appointment of Second Vice-President of the Erie Railroad, and as such will have charge of the operating department. Mr. Merrill has been in railroad service since 1866 in the engineering and operating departments of important Western roads. He is a civil engineer of standing, and an operating officer of the first rank. He has been General Manager of the Burlington since 1890. He has been with the company since 1883, first as Superintendent of its Iowa lines, and later with the title of General Manager of the Hannibal & St. Joseph and the Kansas City, St. Joseph & Council Bluffs roads. He was previously General Superintendent of the Chicago & Iowa division of the Wabash, and General Superintendent of the Chicago & Alton, so that he has had a long experience in the details of practical railroad operation. He was at one time Resident Engineer of the Erie at Buffalo, going to that company, as he again does, about 20 years later, from the Chicago, Burlington & Quincy. Mr. Merrill is now 53 years old, and was born at Montague, Mass. He is a member of the American Society of Civil Engineers, having been elected in 1874.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—The directors of the new company met at Topeka on Dec. 12 and elected Aldace Walker, Chairman; E. P. Ripley, President; D. B. Robinson, First, and Paul Morton, Third Vice-Presidents, and Victor Morowetz, General Counsel. A committee of three was appointed to select other officers and report at a meeting to be held in New York next week.

Baltimore & Philadelphia.—The annual meeting of the stockholders of the company was held at Wilmington, Del., Dec. 11. The following directors were elected: Thomas King, J. B. Washington, William M. Canby, William Canby, Henry A. Dupot, W. T. Dixon, W. H. Addicks, R. L. Ashurst, J. Wilcox Brown. The following officers were elected by the Board of Directors: President, Thomas M. King; vice-president, J. B. Washington; general manager, R. B. Campbell; secretary, John C. Farra; treasurer, W. H. Ijams; auditor, G. W. Booth.

Choctaw, Oklahoma & Gulf.—G. F. Huggans is the name of the new General Superintendent of this road. This appointment was incorrectly reported in a recent number of the *Railroad Gazette*. Mr. Huggans will have his headquarters at South McAlester, I. T.

Des Moines & Kansas City.—Following the purchase of this road by the Keokuk & Western, announcement is made of the election and appointment of officers as follows: A. C. Goodrich is made General Manager; F. T. Hughes, General Counsel; J. F. Elder, Secretary and Assistant Treasurer and General Passenger Agent; A. Macrae, General Freight Agent; J. P. Boyle, General Superintendent; T. R. Board, Auditor; R. D. Lewis, Purchasing Agent, with headquarters in Keokuk; W. B. Burson, Trainmaster; W. Augustus, Superintendent of Machinery; D. Olevy, General Roadmaster, with headquarters at Centerville. Thomas Dewit Cuyler is made President and Charles M. Jesup Treasurer of the combined corporation.

Duquesne Branch, West Side Belt.—The directors of this new company are as follows: James D. Callery, President, Pittsburgh; and John C. Reilly, W. J. Burns, John S. Scully, William D. Evans, all of Pittsburgh, and James W. Scully, Allegheny, Pa.

Erie.—Robert E. Breder has been appointed Traveling Passenger Agent, with headquarters at Kansas City, succeeding E. G. Davidson. For the last 11 years Mr. Breder has been Traveling Passenger and Ticket Agent of the Atchison in New York State, Ohio and Kansas City.

Fitchburg.—Governor Greenhalge, of Massachusetts, has reappointed Charles P. Plunkett as State Director of the Fitchburg road.

Galveston, Houston & Henderson.—The stockholders elected the following directors at Galveston on Dec. 15: George J. Gould, T. M. Campbell, John M. Duncan, H. C. Rouse, R. B. Baer and James A. Baker, Jr.

Indiana, Decatur & Western.—The annual election of the company was held in New York last week. The officers elected are: President, M. D. Woodford; Vice-president, H. F. Shoemaker; Secretary, George R. Balch; Treasurer, F. H. Short.

Lehigh Valley.—Mr. Eugene Delano, a well-known banker of Philadelphia, has been elected a Director of the railroad company.

New York & Long Island.—At the annual meeting of the stockholders last week, the following directors were elected: William Steinway, H. S. Kearney, H. E. Kleber, Louis von Bernuth, Walter J. Foster, John Bogart, A. G. Mills, W. D. Baldwin, Herbert Steward, Malcolm W. Nivers, Edward A. Green and H. D. Low, of New York; and A. J. Benedict, of London.

Plant System.—J. W. Carr has been appointed District Passenger Agent of the Plant System, with headquarters in Savannah, to succeed W. V. Lifsey, recently made Division Passenger Agent, with headquarters at Montgomery, Ala. Mr. Carr has been connected with the Plant System since June as Traveling Passenger Agent at Tampa, Fla.

Santa Fe, Prescott & Phoenix.—At a meeting of the Board of Directors held at the office of the company in Chicago, last week, the following were elected officers of the company for the ensuing year: F. M. Murphy, President and General Manager; D. M. Ferry, Vice-President; C. C. Bowen, Secretary and Treasurer; F. J. Sarmiento, Assistant Secretary, Assistant Treasurer, and Auditor; G. W. Kretzinger, General Counsel, and W. A. Drake, Chief Engineer. Executive Committee—F. M. Murphy, C. C. Bowen and N. K. Fairbank.

Seaboard Air Line.—General Eastern Passenger Agent Farnsworth has announced the appointments of O. H. Kroh as Traveling Passenger Agent, with headquarters in New York; Joseph Strang, Traveling Passenger Agent for New England, with office in Boston, and Charles L. Longsdorf, Passenger Agent in Philadelphia.

South Carolina & Georgia.—Mr. F. A. Healy has been appointed General Auditor, with office at Charleston, S. C., and has assumed charge of the accounting department.

Washington Connecting.—The company has been organized with Wm. H. Hays, Director of Pittsburgh as President, and R. S. Martin, Joseph Painter, A. M. Brown and John Slater as directors.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Bangor & Aroostook.—The branch to Ashland, Me., will probably be completed to that town before the end of this week. At the end of last week the track had been laid to within two miles of Masardis, 32 miles from the junction with the main line, and it is expected that the track will be completed the entire distance, 43 miles, by Dec. 21. The line is graded all the way and the road-bed is exceptionally good. If the line is completed by the time mentioned the branch will be opened for traffic by Jan. 1. The main line to Houlton was opened on Jan. 1, 1894, to Caribou on Jan. 1, 1895, and it is hoped to have trains into Ashland on Jan. 1, 1896. The lines now in operation are as follows: From Bangor to Caribou, 188 miles; Fort Fairfield branch, 14 miles; Moosehead Lake division (that part of the old B. & P. above Milo Junction) 49 miles; Katahdin Iron Works road, 13 miles; Ashland branch from Oakfield, or Ashland Junction, 43 miles, making the total 307 miles. Prospective extensions from Caribou to Van Buren and from Ashland to Fort Kent will add to the length of the road, but their construction is still indefinite.

Benwood & Southern.—This road was put into operation on Thursday of last week. It extends from Wheeling, W. Va., to Moundsville, 12 miles. The cost of construction was about \$200,000.

California Eastern.—When the Nevada Southern road was recently sold by decree of Court in San Bernardino, Cal., its name was changed to the California Eastern, and it was placed in the hands of a receiver until complete organization could be effected. The present receiver, W. H. Seibert, General Woodbury, of Denver, the President of the old Nevada Southern, and Augustus Schofield, of San Francisco, its former Vice-President, in connection with several others in interest, held a joint meeting in Los Angeles, Cal., last week, and preliminary arrangements for completing the organization were made. It was further decided to start the construction of the proposed extension from Manvel north to Good Spring. There is a possibility of further extension into Southern Nevada and Utah.

Canada Atlantic.—The Rockland branch of the road, extending from South Indian, Ont., to the Ottawa River, was opened for regular freight and passenger business last week. The line is 16 miles in length. Large lumber mills are situated at Rockland. The United Counties Railway joins with the Canada Atlantic at South Indian.

Chicago, Kalamazoo & Saginaw.—A first mortgage for \$225,000 was filed at Kalamazoo, Mich., on Dec. 19, by the railroad company in favor of the Union Trust Co., of Detroit, covering its 44 miles of road from Kalamazoo to Woodbury. The mortgage runs for five years at six per cent. The object is said to be the extension of the road to Saginaw and also the construction of a branch to Gull Lake, Barry County.

Duquesne Branch, West Side Belt.—James D. Callery, and others of Pittsburgh, have organized this company, and the charter was filed at Harrisburg, Dec. 16. The road to be built will be about 10 miles long, extending from a point in Baldwin township, Allegheny County, near Broughton Post-office to a point in Mifflin township, near the mouth of Thomson's Run, on the Monongahela River.

Elsinore, Pomona & Los Angeles.—Articles of incorporation were filed at Los Angeles, Cal., Dec. 5, by this company, organized to construct a standard-gauge steam road from Elsinore, by way of Pomona, to Azusa, with a branch line from Pomona to Lordsburg. The estimated length of the main line is 57 miles, and of the branch, 3 miles. The principal place of business is to be Los Angeles. The five directors are: K. H. Wade, of the Southern California road; G. Holterhoff, Jr., and H. C. Whitehead, of Los Angeles; James Hill, of Elsinore, and N. C. Hudson, of South Riverside. The capital stock is \$1,500,000. The amount actually subscribed is \$800,000, equal to \$1,000 for each mile of the railroad. K. H. Wade, as trustee has subscribed for 500 shares. This line is to be built as a branch of the Southern California, the local line of the Santa Fe in California. K. H. Wade, the President of this new company, is the present General Manager of the Southern California.

Hudson & Pacific.—Another Hudson Bay Railroad scheme is to make its appearance at Ottawa. It will be known as the Hudson Bay & Pacific Railway, and proposes to connect Calgary, in Alberta, with Fort Churchill, as well as operate a fleet of steamers. Application will be made for incorporation at the next session of the Dominion Parliament.

Lehigh Valley.—A loop line from South Plainfield, on the main line, into Plainfield, N. J., is, it is reported, to be built next year. The building of the road will be in response to inducements made by Plainfield business men, who are anxious that a road in competition with the Central of New Jersey shall enter the town.

Leroy & Northern.—The New York Railroad Commissioners have refused the application of the company for permission to construct its road. The proposed road was to have been three miles in length at Leroy, east of Batavia. The Board denies the application on the ground that branches of the New York Central or Erie roads can be constructed, which will accomplish the purpose intended, and says that the public necessity does not require the construction of an independent road.

Lima Northern.—The construction work on this road north of Lima is making good progress, and last week was completed to Ottawa, 21 miles from Lima. At Columbus Grove connections were made with the Northern Ohio, formerly the Pittsburgh, Akron & Western. North from Ottawa the line is rapidly nearing Leipsic. Freight trains of the Ohio Southern will commence running to Ottawa this week. The new passenger station, jointly erected by the Lima Northern and Ohio Southern has been completed.

Long Island.—The railroad has completed the extension of its line on the south shore of Long Island, near its eastern end, from Amagansett to Fort Pond Bay, Montauk. The distance from Amagansett is 12 miles. The train service began on Tuesday, Dec. 17.

Manchester & Milford.—The Board of Commissioners appointed by the New Hampshire Supreme Court to hear parties and report facts to the court upon the petition to extend the Fitchburg road from Milford to Manchester, N. H., has closed hearing and will probably soon submit its report. This company made application to the last New Hampshire Legislature for a charter to construct its road, but this was refused. It is only a short line, an extension of the Brookline & Milford, to the important town of Manchester. The project has been opposed by the Boston & Maine and the Concord & Montreal, but supported by the Fitchburg, which operates the Brookline & Milford.

Missouri, Kansas & Texas.—J. W. Petheram, engineer of the road for Texas, is surveying a line from Belton, Bell County, Tex., to quarries of building stone, about five miles northwest of the town.

New Mexico & Western.—This company has filed articles of incorporation in Santa Fe, N. Mex., with the Territorial Secretary. The incorporators are William D. Cameron, of New York; James J. Schuler, David W. Stevens, Edward H. Smith and Jeremiah Leahy, of Raton. The principal place of business will be Maxwell City, Colfax County, N. M. The route of the proposed road is not given, but it is said that the line will be a connection of the Chicago, Rock Island & Pacific.

Peoria, Lacon & Northern.—A railroad company is being organized at Lacon, Ill., under this name by J. M. McNabb, of Palatine; R. B. Fort, Mayor of Lacon; Maj. Geo. F. Wightman, of Lacon, ex-City Engineer of Peoria; Dr. T. M. McIlvaine, of Peoria, and E. C. Howlett, of Peoria. The line is to extend from a point opposite Peoria to Spring Valley. It will pass through Spring Bay, which has no railroad; connect with the Santa Fe opposite Chillicothe; connect with the Alton at Lacon, with the Chicago & Northwestern at Spring Valley, and making other important connections. The line will be about 50 miles.

Philadelphia, Wilmington & Baltimore.—Drake & Stratton have received the contract for straightening the line of this road between Elkton, Md., and Iron Hill, a distance of three miles. The new track will be comparatively straight, the present line having many curves. Contractor Charles A. Porter, of Philadelphia, who formerly was awarded this contract surrendered it.

Rockport & Northern.—A charter for an important project under this name was filed in Texas last week. The road will extend from Rockport to Smithville, 145 miles, and connect with the Missouri, Kansas & Texas. It will be built by Baltimore and New York capitalists at a cost of \$5,000,000.

San Francisco & San Joaquin.—The tracklaying forces are now 23 miles out from Stockton and have reached the Stanislaus River. The first freight hauled was a carload hauled from one of the warehouses in the city to the Southern Pacific track, a mile distant.

Southern.—A large force of workmen is at work along that part of the line between Norfolk, Va., and Greensboro, N. C., replacing wooden bridges with iron ones and strengthening several iron structures, trestles, etc., preparatory to the opening of the route next month. These improvements are made necessary on account of the new heavy locomotives and long through freight trains which will be operated over this route, it heretofore having been confined to local traffic, which was handled by light engines.

Southern Counties.—Application will be made to the Parliament of Canada, at its next session, for an act to incorporate this company, to construct a road on the south shore of the River St. Lawrence, from a point at the northern limit of the County of Chambly, to a point at or near the City of Sherbrooke, passing by way of the towns of St. John's and Ibterville.

Staten Island Rapid Transit.—The work of double-tracking the Tottenville division of the road has been completed as far as Annadale, and the new part of the line is in use. This gives a second track from St. George to Annadale, 14 miles. Work is progressing rapidly on the new ferry slip and terminal at Tottenville.

Tygart's Valley, Buckhannon & Point Pleasant.—The County Court of Upshur County, W. Va., has issued bonds to the amount of \$30,000 to the railroad company. The court also accepted a bond offered by the company insuring the completion of the road.

Union Pacific, Denver & Gulf.—The Receiver has let a contract to D. Linscott, of Laramie, Wyo., for the delivery at Uva station, on the Cheyenne & Northern line, of 50,000 ties. It is believed that these ties are to be used in the construction of a proposed spur from the Cheyenne & Northern main line to the Hartville iron fields, in Southern Wyoming, about 12 miles distant from the main line.

Washington Connecting.—This company was incorporated at Harrisburg, Pa., on Dec. 17, to build a road from a point on the B. & O., in Canton township, Washington County, thence northerly through said township to a point near Tyler Tube Works on the Charters Valley road. The capital is \$30,000. William H. Hays, of Pittsburgh, is President.

Electric Railroad Construction.

Akron, O.—The Akron Street Railway & Illuminating Co., which has succeeded the Akron Street Railway, and the Akron General Electric Company, has received its charter. The power house of the old street railroad will be abandoned and the power house of the Electric Light Company will be used alone, the capacity of which will be increased to 1,200 H. P.

Albuquerque, N. Mex.—Harry D. Johnson and Edward A. Pierson have been granted a franchise by the council for an electric railroad.

Allegheny, Pa.—A charter for the Allegheny & Evergreen Street Railway Co., with a capital of \$30,000, to build a line five miles long in this city, was granted last week.

Belleville, Ill.—The Belleville Electric Railroad Company has let the contract to Hilb & Bauer for the erection of its new power house, for \$7,192.

Brooklyn, N. Y.—The Brooklyn Bridge, Prospect Park & Eastern Railway Company, was incorporated last week to build an electric road about 45 miles in length in Brooklyn; capital, \$500,000.

Chicago, Ill.—Commissioner of Public Works Kent has granted a permit to the Englewood & Chicago Electric Street Railway Co. to construct tracks under ordinances passed last spring by the council. The road is to operate in Hyde Park and the town of Lake, covering in the latter district the extreme southwestern portion of the city.

Fall River, R. I.—At a meeting of the Board of Aldermen last week it was voted to grant the Fall River Street Railroad the right to extend its tracks from Pine street to Turner street, through Durfee street, a distance of less than a mile.

Fort Wayne, Ind.—A Cleveland syndicate, headed by John J. Shipperd, has bought the street car system of Fort Wayne, Ind. The new company will be known as the Consolidated Electric Railway Co., and is capitalized at \$1,500,000.

Los Angeles, Cal.—The Council has passed the final ordinance granting to the Los Angeles Traction Co. a franchise for an electric railway in Eighth street.

Mechanicsburg, O.—The Council has granted a franchise to Messrs. Hunter, Moore & Co., of Urbana, O., for a trolley line on Main street, connecting with the Piqua, Urbana & Columbus Electric Railroad. The road is to be in running order within 18 months.

Middletown, Md.—John W. Wilson and A. B. Castle have been awarded the contract to furnish the 23,000 ties needed for the Frederick-Middletown Railroad. Joshua D. Wachtel, of Meyersville, has the contract for the masonry between Middletown and the mountain.

Pittsburg, Pa.—The rebuilding of the roadbed of the main line of the Duquesne Traction Company is nearly completed. Twelve miles of new track have been laid with 90-lb. rails.

The section of the Fort Pitt electric road on Center avenue is nearly finished and when completed there will be only two small stretches of track near Twenty-sixth street to be put down.

Port Chester, N. Y.—The Port Chester Electric Railway Company was incorporated last week, to construct a street surface road about 10 miles in length in the village of Port Chester; capital, \$500,000.

Port Jervis, N. Y.—The Port Jervis Electric Street Railway Co. has been incorporated with a capital of \$70,000, to operate a road in Port Jervis seven miles in length.

Pottstown, Pa.—A charter has been granted by the State Department to the Pottstown & West Chester Electric Railway Co. Capital, \$500,000. The President is Joseph P. Robinson, of Philadelphia. The line will be 22½ miles long, reaching Pughton, West Vincent and Marionville.

Rockland, Me.—The Rockland, Thomaston & Camden Street Railway Co. has voted to extend the Rockland & Highlands branch.

Sacramento, Cal.—An ordinance has been passed authorizing the Central California Electric Company to extend its lines from Sacramento to Roseville.

St. Louis, Mo.—The Fourth & Arsenal Street Railway Co. has been organized and will let contracts for an electric railroad. Charles Green is President and Charles J. Maguire Secretary.

The Forest Park & Clayton Electric Railroad is now completed, and cars are to be put in operation on that line between Clayton and Forsythe Junction, where connection will be made with the Delmar Avenue line of the Lindell Railway. The fare from Clayton to any point in the city reached by the Lindell system will be 10c.

Work is progressing rapidly on the St. Louis & Kirkwood Electric Railroad. The tracks are laid from the eastern terminus of the road, at the southwest corner of Forest Park, to Meramec Highlands, the western terminus. The contractors are to have their work completed before Jan. 1, and cars will be run over the entire line soon after the work is completed.

San Jose, Cal.—It is proposed to build an electric railroad from Saratoga to Mayfield, and at a meeting at Saratoga \$45,000 was subscribed in a short time.

Scranton, Miss.—Martin Turnbull has been granted a franchise for building a street railroad through the town. The grant is on condition that work begins on the road within 60 days after signing the contract with the town, and that it must be completed and in operation four months after work is begun.

Xenia, O.—The rapid transit company has contracted with the George F. Mellen company, 111 Broadway, New York, to build the electric road from Xenia to Springfield; work to commence Feb. 1, 1896.

GENERAL RAILROAD NEWS.

Atlantic & Pacific.—The holders of about \$17,850,000 of the guaranteed four per cent. bonds of the Atlantic & Pacific have brought suit against the Atchison Topeka & Santa Fe, the members of the Joint Executive Reorganization Committee and the New York Guaranty & Indemnity Co., the Union Trust Co. and the Mercantile Trust Co. as depositaries and mortgagees. The plaintiffs as creditors of the Atchison Company to the extent of upward of \$8,750,000, upon the Atchison guarantee upon their bonds, claim that the Atchison reorganization plan under which the Reorganization Committee has foreclosed and purchased the property, was an agreement of the stock and bondholders, to reorganize the property in their interest as stockholders and bondholders, and to reinstate the existing securities in their order of priority, and that that cannot lawfully be done to the exclusion of the interests and rights of intermediate creditors. The plaintiffs also claim that whatever securities are, under this reorganization plan, to go the old Atchison stockholders, and whatever assets are to go into the treasury of the new company are subject to the payment of their claims and those of other bona fide creditors of the Old Atchison Company, similarly situated, and they ask to have such securities and property taken possession of by the court.

Central of Georgia.—The company filed in the Probate Court at Savannah, on Dec. 16, a deed of trust and a mortgage to the Mercantile Trust Co., of New York, for \$18,500,000, to protect an issue of five per cent. 50-year bonds to that amount.

Chicago, Peoria & St. Louis.—That part of the road between Mount Olive and Springfield, Ill., has been sold, it is stated, to the St. Louis & Eastern. The latter is a coal road running between East St. Louis and Mount Olive, a distance of 47 miles. The reported acquisition of the Chicago, Peoria & St. Louis branch will complete the line of the St. Louis & Eastern to Springfield and give it 100 miles of track and valuable connections.

Columbus, Shawnee & Hocking.—Two railroad mortgages, given by the company, are being filed in the various counties in Ohio, through which the road extends. One is for \$2,000,000 in favor of the Mercantile Trust Company of New York, payable in gold five years after date, with interest at five per cent. The other is

for \$10,000,000 in favor of the Metropolitan Trust Company, payable in gold Jan. 1, 1946, with interest at 2½ per cent. to Jan. 1, 1898; three per cent. to Jan. 1, 1900, and four per cent. the balance of the time.

Choctaw, Oklahoma & Gulf.—Surveys are now making for an extension of the road from Fort Reno, I. T., to the line of the Fort Worth & Denver City road at Canadian, Tex. Construction will begin as early in the spring as practicable. The company will also extend a branch from Calvin, I. T., south to Denison, Tex., and an extension to Fort Smith, Ark., is also contemplated.

Denver, Leadville & Gunnison.—Application for the sale of the road was made by Receiver Trumbull in the United States Court, at Denver, on Dec. 16. The receiver reported that the earnings of the road were now equal to the charges. When he was appointed receiver, the operation of the road was resulting in a large monthly deficit.

Great Northern.—The suit of T. W. Pearsall, one of the stockholders of the company, who some months ago brought suit against the officers and directors to prevent the carrying out of the proposed agreement for the guarantee of the Northern Pacific securities, has been carried to the United States Supreme Court. Briefs of the counsel on both sides were filed last week at Washington. It will be remembered that this suit was brought in the United States Circuit Court of Minnesota, and by Judge Sanborn was decided in favor of the defendant, Judge Sanborn refusing to grant the injunction asked for to restrain the carrying out of the proposed guarantee.

Indiana, Decatur & Western.—It was announced last week that this road had been sold to some of the officials of the Cincinnati, Hamilton & Dayton, and will become a part of that line. The purchasers are Henry A. Taylor, Henry F. Shoemaker and M. D. Woodford. The first named are directors and the last is the President of the Cincinnati, Hamilton & Dayton. The directors met in New York and M. D. Woodford was elected President; Henry F. Shoemaker, Vice-President; George R. Bachm, Secretary, and F. H. Short, Treasurer. The road extends from Indianapolis to Decatur, a distance of 153 miles, and will be of advantage as a Western outlet for the C., H. & D. There has been a through car arrangement between the two roads between Cincinnati and Decatur for several years.

Lancaster & Hamden.—In the United States Court, at Columbus, O., on Dec. 13, W. H. Stevenson, of Boston, was appointed Receiver of the railroad, vice John G. Short, resigned. This road has been building for a number of years from the Jackson County coal fields, in Southern Ohio. Only 21 miles of the track has been laid, but the road is graded for more than twice that distance. Col. Stevenson became interested in the property early this year, and, with his friends, expects to reorganize it and to extend it as previously described in these columns.

Minnesota & Wisconsin.—In the suit of the American Loan & Trust Company against the railroad company, Judge Bunn of the United States Court, at Madison, Wis., this week, entered a decree of foreclosure sale. The company operates about 23 miles in Northern Wisconsin and was built a few years ago by ex-Senator Sabin.

Monongahela River.—This railroad company, a line closely identified in ownership with the West Virginia Central & Pittsburgh, has purchased the West Virginia coal lands controlled by the Monongah Coal & Coke Co. The railroad line extends from Clarksburg to Fairmount, W. Va., touching the Baltimore & Ohio at both of these points. Short branch line extensions will be constructed to reach the coal lands, as recently outlined in these columns, at numerous points. The output will reach a market over the Baltimore & Ohio.

New York, Pennsylvania & Ohio.—The Attorney of the company makes the following explanation of the recent Receivership suits in Ohio: "The company is suffering the foreclosure of its property on the Summit County Court of Common Pleas, at Akron, at the suit of the Farmers' Loan & Trust Co., on first mortgage, on which there is overdue over \$73,000,000. Its second mortgage trustees are parties to the suit, and the sale that is to be asked for is to be made subject to the lien of the prior lien mortgage of \$8,000,000. After the foreclosure and sale shall have been accomplished, the property will become an integral part of the Erie Railroad."

The second suit brought last week in Ohio for a receivership under which Daniel Pabst was appointed Receiver by a state court, it seems, grew out of a claim against the company for something under \$5,000. This claim was settled during the week by the reorganization committee, and of course the appointment made will be rescinded. Mr. J. Kennedy Tod, of New York, who had previously been appointed Receiver, will continue in the control of the property until the foreclosure, in accordance with the plan of reorganization.

Oregon Short Line & Utah Northern.—The committee appointed to reorganize the company is composed of Samuel Carr, chairman; Alexander E. Orr, New York; Nathaniel Thayer, Gardiner M. Lane, Boston; W. G. Oakman, President of the New York Guaranty & Indemnity Company; A. A. H. Boissevain, representing the Dutch committee, and Gordon Abbott, Vice-President of the Old Colony Trust Company. It is understood that this committee represents all interests in the property and that its formation will result in stopping all litigation. It intends to publish a plan of reorganization shortly, and the latter is said to be nearly completed.

Philadelphia & Reading.—The reorganization committee plan prepared by the Olcott-Earle Committee, was published on Monday of this week by J. P. Morgan & Co., who will act as managers to carry the plan into effect. In a circular to security holders, issued by the firm, they say: "Unless the acceptance of this plan shall be so general as in the opinion of the managers to obviate the necessity of foreclosure, the properties of the existing Reading companies will be sold and successor companies will be organized under the laws of Pennsylvania; and the stocks and securities of these successor companies will be vested in a new company, formed or to be formed under the laws of Pennsylvania or some other state. In our opinion there is no serious difficulty in the way of reorganization by foreclosure, and the plan has been prepared on the assumption that foreclosure will probably be necessary."

The plan provides for an issue by the new company of \$114,000,000 general mortgage 100-year 4 per cent. gold bonds, \$28,000,000 4 per cent. first preferred stock, \$42,000,000 4 per cent. second preferred stock, and \$70,000,000 of common stock. The mortgage will provide for an additional issue of \$21,000,000 to meet, if desirable, the terminal bonds and the coal and iron bonds, thus bringing the properties on which these issues are secured also under the new general mortgage. The

mortgage will become a lien also on equipment, after the payment of \$7,300,000 of car-trust obligations, for which provision is made; upon properties or securities of 327 miles of railroads owned by the company and 552 miles of leasehold lines; upon all of the property of the coal and iron company, representing nearly 200,000 acres of coal and timber land, and upon the capital stock owned of various properties essential to the system, not covered by the present general mortgage. Of the new bonds, \$44,550,000 will be used for undisturbed bonds, \$4,000,000 are sold to a syndicate, and \$20,000,000 are for new construction, additional equipment, etc., under carefully guarded restrictions, not over \$1,500,000 to be used in any one year. These bonds will be used only in such manner as additionally to secure the new mortgage. The new company will have the right after dividends at the rate of 4 per cent shall have been paid for two successive years on the first preferred stock to convert the second preferred stock, one-half into first preferred and one-half into common stock. A voting trust will be created, to continue five years and thereafter until the first preferred stock shall have received 4 per cent. dividends for two successive years.

An assessment of 20 per cent. must be paid by the first, second and third preference income bonds and stock, and of 4 per cent. by the deferred incomes. The first preference incomes, upon payment of the assessment, will receive 30 per cent. of new first preferred stock and par in second preferred, the second preference incomes will receive 60 per cent. in second preferred and 55 in common stock, the third preference incomes will receive 35 per cent. in second preferred and 85 per cent. in common stock, the old common will be exchanged dollar for dollar for new common, and the deferred incomes will receive 20 per cent. in new common stock. A syndicate has been formed which underwrites the assessments and cash requirements of the plan, about \$28,000,000, and also guarantees the extension or payment of some \$20,000,000 improvement mortgage bonds and coal and iron bonds, most of which will mature within the next two years. This syndicate has agreed to take \$4,000,000 of the new general mortgage bonds and \$8,000,000 of new first preferred stock, and will contribute \$7,300,000 in cash. The present fixed charges of the railroad and coal and iron companies amount to \$10,055,073 a year; under the plan they will be reduced by \$717,900 to \$9,317,173. The net earnings for the year ended Nov. 30, were \$9,624,123. The new company will start relieved of car trust obligations, without floating debt, and with about \$3,000,000 of working cash capital.

The estimated requirements of the plan (including general mortgage interest up to January 1, 1896), are as follows: Floating debt, \$3,800,000; receivers' certificates, \$3,800,000; car trust and equipment notes, \$7,300,000; interest general mortgage bonds, \$6,250,000; arrearages of sinking fund, divisional coal mortgages, \$2,000,000; reorganization and other expenses, including commissions to bankers, \$2,000,000; total, \$25,150,000. The assessments will yield \$20,862,289; the syndicate will contribute in cash \$7,300,000; total \$28,162,289, leaving an estimated cash balance of about \$3,000,000, to be used for the purposes of the new company.

Terminal Railway of Buffalo.—The New York State Railroad Commissioners have received an application from the railroad company for approval of a proposed increase in the capital stock of the company from \$500,000 to \$1,000,000.

Washington & Chesapeake Beach.—The franchise and other assets of this projected road have been purchased at public sale by J. Kennedy Tod & Co., of New York, for \$31,000. The firm is said to be a creditor of the road for something less than \$50,000. The line runs from Washington east to Chesapeake Beach, Md. It is already graded in part and the property includes 700 acres of land on the shore.

Wichita & Western.—Receiver McEntire has decided to suspend the operation of 30 miles of this line between Cullison and Mullinville, Kan., the terminal point. The road will be operated as usual between Wichita and Cullison. The reason for the present abandonment of the western 30 miles of the line is that the company receives little freight or passenger revenue from it.

Judge Foster, of the State Court, has issued an order authorizing the company to borrow \$20,000 on receiver's certificates for the payment of taxes. The order was asked for by J. H. McIntire, Receiver for the road.

Electric Railroad News.

Baltimore, Md.—The Directors of the City Passenger Railway Company have declared a dividend of 5 per cent. on the business of the six months ended November 30. They have also decided to recommend to the stockholders, at the meeting to be held next month, an issue of 10,000 shares of additional stock, to be sold to the stockholders at par, \$25 per share. This action of the board was a surprise, and the stock quotations dropped from 75½ to 72½.

Mill Valley, Cal.—The directors of the Mill Valley & Mount Tamalpais Railway will be Lovell White, Thomas Magee and Henry C. Campbell representing the Tamalpais Land & Water Co.; Sidney B. Cushing, representing the San Rafael Electric Light Co. The price to be charged for the round trip has been placed at \$1. The road, which is to be about seven miles long, has an 8 per cent. grade, and is a few miles north of San Francisco.

Pittsburgh.—A meeting of the stockholders of the several Pittsburgh street railway companies will be held on December 3, to vote on the lease of their respective properties to the Consolidated Traction Company.

Portland, Me.—The post office department has made a contract with the Portland & Cape Elizabeth Electric Railroad for carrying mails between Portland and the adjacent towns. The contract, which goes into effect on Jan. 1, requires the mail to be delivered at least six times a week.

Salem, Ore.—The Salem Consolidated Street Railway Co. has passed into the hands of a receiver upon petition of E. P. McCormack, President of the First National Bank of Salem.

TRAFFIC.

Traffic Notes.

On Dec. 13 the Lehigh Valley took a party of 150 passenger agents of New York, Philadelphia and Baltimore on a trip over the road, including a visit to Niagara Falls.

The New York and Florida special over the Atlantic Coast line will begin its regular trips between New York and St. Augustine on Jan. 6. This is a solid vestibuled train, with steam heat and electric lights.

The Central Vermont, which, as everyone knows, forms an air line (for freight) between New York and Chicago, is to have two new steel steamers next season to run on the New York-New London section of this through line. The vessels are being built by John Roach at Chester, Pa. They are 282 ft. long, 4½ ft. beam, and 19 ft. in depth. The boats will cost about \$250,000 each.

A press dispatch from Portland, Or., Dec. 13, says that the Receiver of the Oregon Railway & Navigation Company has contracted with the Samuel Samuels Company, of Yokohama, for a line of steamers monthly for 10 years between Portland and the Orient. The name of the line is the Oregon Railway & Navigation Company's Asiatic Steamship Line, in connection with the Great Northern Railway. Steamers are to be of minimum capacity, 30,000 tons, and provision is made for increasing frequency and carrying capacity of steamers as growth of business justifies.

The much-discussed traffic agreement between the Panama Railroad and the Pacific Mail Steamship Co. has finally been signed. It provides for an amicable interchange of business by the two companies. The steamers in the Atlantic service will be operated by the Panama Railroad, and the steamers in the Pacific service will be owned and run by the Pacific Mail. The agreement gives the last-named company exclusive rights between San Francisco and Panama, and also the entire carrying trade between the western coast of South America and China and Japan, which goes by way of Panama and San Francisco. The Panama company will have the privileges of the Atlantic coast trade without any interference from the Pacific Mail. In the division of through traffic the Panama will get 55 per cent. and the Pacific Mail 45 per cent. The three steamships owned by the Pacific Mail now in the Atlantic service will be sent to the Pacific as soon as possible.

Passenger rates to the Atlanta Exposition have been lower than any ever before known on Southern railroads. The Seaboard Air Line, which is not a member of the Southern States Passenger Association has been making rates for a month far below those of the lines in the Association, and last week the Association's rate committee held a meeting at Savannah, and decided to make round trip rates to the Exposition as follows: Over 250 miles, 50 per cent. of first-class fare one way; over 100 and less than 250 miles, 60 per cent. of one first-class fare; over 25 and less than 100 miles, one cent a mile; less than 25 miles, one fare for round trip. Tickets are to be limited to five days, and minimum fare 25 cents. The Seaboard Air Line is likely to put the fare down even below the basis fixed by the Association. The Exposition closes Dec. 31. The Southern Railway announces that the round trip rate from Washington, D. C., from Dec. 19 to 25 inclusive, tickets good for five days, will be \$8.75. This is about 7½ mills a mile.

Chicago Lake Shipments for the Season.

The last vessel of the season left Chicago on Dec. 12. Navigation has been open this year 239 days and the lake fleet has carried nearly 25,000,000 tons of freight. The quantity of grain taken out of Chicago was 83,835,149 bushels, and the average rate for the season was equal to 1.7 cents a bushel (on corn) to Buffalo. Rates were low all the first part of the season, but in the fall the Lake Superior trade was heavy and all rates went up. In October for a short time 4 cents a bushel was got for corn from Chicago to Buffalo. The high rates secured on ore, grain and flour from Lake Superior points are familiar to the reader from notes in recent issues of the *Railroad Gazette*. The Chicago *Inter-Ocean* says:

"The condition of flour trade through the West and Southwest, in contrast to the great boom in that industry through the Northwest, is shown in the decrease in the shipments of flour from 1,630,345 barrels in 1894 to 787,512 barrels in 1895. Shipments through Chicago dropped off 50 per cent., while enough boats could not be secured to carry all the flour going forward from the head of Lake Superior. Two of the most unusual items, due largely to the same cause of a poor wheat crop in the southern belt, appear in the movement of grain. Chicago shipped to Toledo for milling purposes by lake 2,393,799 bushels, and for storage purposes received from Duluth 1,240,393 bushels. Low water played havoc with the St. Lawrence River route as an outlet to the seaboard at Montreal. Wheat shipments by that route dropped from 1,434,455 bushels in 1894 to a little over 200,000 bushels in 1895. Montreal as an ocean port lost nearly all its business, even on Canadian wheat from Manitoba, on account of the decrease in the draft of vessels at the Welland Canal."

The quantities of different kinds of grain shipped from Chicago were as follows, in thousands of bushels:

	1895.	1894.
Wheat.....	13,158	15,017
Corn.....	47,702	37,149
Oats.....	17,671	13,911
Barley.....	5,244	2,868
Rye.....	57	29

The marine underwriters extended the period of insurance this year to Dec. 10, and it is said that the results have been satisfactory to them; but it is predicted that next season they will refuse to take risks on schooners and barges after Dec. 1.

Coal shipments from Buffalo by lake this year exceed those of 1894 by 135,513 tons, but are considerably behind the shipments in 1892 and 1893. They were:

1895.....	2,620,768 tons.
1894.....	2,485,255 "
1893.....	2,703,673 "
1892.....	2,832,330 "

Interstate Commerce Commission.

RATES ON IRON FROM PUEBLO TO SAN FRANCISCO.

The Interstate Commerce Commission, in an opinion by Commissioner Clements, has announced its decision in the case of the Colorado Fuel & Iron Company against the Southern Pacific Company and other carriers, relating to the legality of rates on steel rails, bar iron and other iron and steel articles from Pueblo, Col., to San Francisco.

The complaint alleged that the defendants charged an unjust rate of \$1.60 per 100 lbs., while from Chicago the rate was only 60 cents on steel rails and 50 cents on bar iron. It also appeared that the same rates were in force to San Francisco from New York as from Chicago to San Francisco. In their answers the defendants offered conditionally to put in the same rates from Pueblo to San Francisco, as those in force from Chicago.

The Commission decided, among other things, as follows:

"Water competition is altogether inadequate to account for the general relatively low rating of lumber, grain and other staple or heavy goods to or between inland points, and that of a long list of commodities, including iron and steel, to San Francisco from Chicago and so-called Mississippi River and Missouri River points. Whatever may be the merits of carriers' competition as

a defense of lower rates for longer than for shorter hauls, the former involving greater service and expense on the part of the carrier, better cause apparently exists for lower rates where, under higher ones, the traffic is subjected to such disadvantages or prejudices that it will not move at all.

"The shipment of iron and steel from foreign countries to San Francisco at low rates by water affects the iron and steel industry at Pueblo, as well as at Eastern points.

"Rates in force from Pueblo to San Francisco prohibit the movement of iron and steel articles from the former place to the latter, while greatly lower rates from other and far more distant points prevail on such traffic to San Francisco, and the carrier's cost of transportation is much less from Pueblo than from such more distant points of shipment:

"Held, upon all the facts and circumstances in the case, that such rates from Pueblo are unreasonable and unjust, and subject complainant, the localities in the state of Colorado where its industry is carried on, and its traffic in iron and steel articles to San Francisco, to undue and unreasonable prejudice and disadvantage, and result in giving undue preference and unreasonable advantage to other shippers in the United States of iron and steel over the defendant roads to San Francisco."

The order of the Commission is that the rates from Pueblo to San Francisco should not exceed 45 cents per 100 lbs. on steel rails, or 37½ cents on bar iron, cast iron water pipe, pig iron, billets, blooms, rivets, nails and spikes, nor should the rates from Pueblo to San Francisco on such traffic, or on other iron and steel articles, be greater at any time than 75 per cent. of rates from Chicago to San Francisco over any of the defendant roads.

The case is held open for such further proceedings or action as may at any time appear necessary on account of changes in the present relation of rates applying to San Francisco from Chicago, Columbus, Pittsburgh and other Eastern points over the various routes in use.

Chicago Traffic Matters.

CHICAGO, Dec. 18, 1895.

Eastbound shipments continue to increase largely, especially in grain and provisions, and there is little doubt but rates on these commodities are being freely cut.

The Northern Pacific and Great Northern have petitioned the St. Paul-Chicago lines to join them in meeting via Chicago the action of the Soo line in putting in a basing rate of \$16 on second-class passenger business from Winnipeg to New York.

The Central Traffic Association authorizes a final excursion to the Atlanta Exposition on Dec. 20 at one cent a mile for the round trip, with a 10-day limit.

The Chicago live stock exchange has filed petitions with the Illinois State Railroad Commissioners against the Rock Island, Northwestern, Burlington and St. Paul roads, charging them with making extortionate charges in handling cars delivered by them at the Union stock yards. The charges are similar to those made against the Alton, and which were sustained by the Board. The cases will be heard Jan. 8, in this city.

The Union Pacific and Rio Grande Western are unable to agree regarding the payment of passenger commissions, and unless an agreement is reached it may precipitate trouble in the new Western Passenger Association. The trouble arises over the charge of the latter that the Union Pacific has placed blocks of tickets from Montana points via Salt Lake City to Missouri River points in brokers' hands, and the Rio Grande announces its intention of paying brokers a commission of \$5 on each first-class ticket sold over its line from Utah common points to Colorado common points and \$10 on tickets to Missouri River points.

The new bureau of the Western Passenger Association is reported to have already received over 5,000 applications for half-fare permits for clergymen and evangelists.

The recently organized Southwestern Passenger Association, having jurisdiction over Texas business, is in trouble owing to a demand made by the Cotton Belt route for a differential.

Some of the other members favor granting the request while a majority are strongly opposed to the differential principle. The indications are, however, that the Cotton Belt will eventually withdraw its demand. The question will be considered at St. Louis Jan. 7.

Rumors have been current in the newspapers that the new Atchison management was intending to abrogate all contracts and especially the Pullman contract, and replace Pullman cars with Wagner cars. Chairman Walker says that of the several thousand contracts, agreements, leases, etc., all running to the old company, its successors and assigns, 99 per cent. are fair; but of the few already considered and their adoption in their present form found undesirable, the Pullman contract is one; but pending the necessary negotiations over details, which may cover several months, the sleeping car service will continue as heretofore. The subject has not been gone into beyond the point of determining that such negotiations should be had; and in fact no new arrangements of any kind as to the future operation of the property have been made, the whole subject having been relegated to the new management, which will take possession of the road at midnight on Dec. 31. The situation is only that which necessarily occurs upon a transfer of title under foreclosure sale of any going concern. There is no special significance attending the matter.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines for the week ending Dec. 14, amounted to 83,906 tons, against 72,672 tons during the preceding week, an increase of 11,234 tons, and against 40,486 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	WEEK TO Dec. 11.		WEEK TO Dec. 7.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central.....	13,284	15.8	11,181	15.4
Wabash.....	7,523	8.9	5,895	8.1
Lake Shore & Mich. South.	11,913	14.2	9,124	12.6
Pitts., Ft. Wayne & Chicago	8,276	9.9	9,139	12.7
Pitts., Cin., Chi. & St. Louis.	9,139	10.9	8,409	11.6
Baltimore & Ohio.....	7,030	8.4	7,138	9.8
Chicago & Grand Trunk.....	4,054	4.8	3,119	4.3
New York, Chic. & St. Louis	8,942	10.6	8,321	11.4
Chicago & Erie.....	8,564	10.2	5,775	7.9
C., C. & St. Louis.....	5,277	6.3	4,570	6.2
Totals.....	83,906	100.0	72,672	100.0

Of the above shipments 3,519 tons were flour, 41,929 tons grain and mill stuff, 15,660 tons cured meats, 10,940 tons dressed beef, 1,408 tons butter, 1,763 tons hides, and 3,864 tons lumber. The three Vanderbilt lines carried 40.8 per cent., the two Pennsylvania lines 20.8 per cent.